TOXICS RELEASE INVENTORY

# Introduction

## What is the Toxics Release Inventory?

The Toxics Release Inventory, or TRI, is a publicly-available data set containing information reported annually for toxic chemicals manufactured, processed, or otherwise used by certain facilities in Delaware and throughout the United States. Annually, these facilities report releases and waste management information for covered chemicals. The reportable list of toxic chemicals for 2002 included 582 individual chemicals and 30 chemical categories. TRI was established in 1986 under Title III, Section 313, of the Federal Superfund Amendments and Reauthorization Act to provide information to the public about the presence and release of toxic chemicals in their communities. Title III is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

Facilities report TRI information to the U.S. Environmental Protection Agency (EPA) and to the State in which the facility is located. In Delaware, the EPCRA Reporting Program within the Department of Natural Resources and Environmental Control (DNREC) receives and compiles TRI data from facilities located within the State. The EPCRA Reporting Program maintains a database that is updated as new reports are received. The database currently contains sixteen years of reported data. Most releases reported under TRI are also regulated through Federal and/or State permits.

This report provides a summary and analysis of the 2002 TRI data and revisions received as of March 1, 2004 from Delaware facilities.

A second, less detailed report that provides a less technical perspective of the data presented here is also available. See page 46 for details.

## Reporting Requirements

A facility is required to submit a report for a listed toxic chemical if the facility meets all of the following criteria:

1. Employs the equivalent of 10 or more full-time employees,
2. Is a covered industry, or is a federal facility (See Table 1 on the next page for a list of covered industries), and,
3. Manufactures or processes more than 25,000 pounds, or otherwise uses more than 10,000 pounds, of the listed toxic chemical during the course of the calendar year. Limits for specific chemicals known as PBT's (Persistent Bioaccumulative Toxics) are lower (Table 2 on page 3).

Note: From time to time, the EPA proposes changes in reporting requirements. It gives agencies, reporting facilities, and other interested parties time to comment on these changes prior to making a final decision about the proposed change.

Facilities that meet the criteria for reporting must submit one report for each listed toxic chemical manufactured, processed, or otherwise used above threshold quantities. Facilities must submit these reports to DNREC and EPA by July 1 of each year. The reports cover activities during the previous calendar year. It is important to note that a facility may need to report even if it has no releases of the toxic chemical, because reporting is based on the amount manufactured, processed, or otherwise used, and not the amount released.

## TABLE 1
## COVERED INDUSTRIES

| SIC CODES | INDUSTRY |
|---|---|
| 10XX | Metal Mining |
| 12XX | Coal Mining |
| 20-39XX | Manufacturing |
| 4911<br>4931<br>4939 | Oil and Coal Fired<br>Electric Utilities |
| 4953 | Facilities Regulated<br>Under RCRA Subtitle C |
| 5169 | Wholesale Chemical Distributors |
| 5171 | Wholesale Petroleum<br>Stations and Terminals |
| 7389 | Solvent Recovery Services |
| | Federal Facilities |

Table 1 provides a list of covered industries along with corresponding 4-digit Standard Industrial Classification (SIC) codes. SIC codes are used to identify the type of activities performed at a facility. Each industry sector represented by facilities reporting in Delaware for 2002 is described in Table 5 on page 10.

The standard report (Form R) contains general facility information and data about on-site releases, off-site transfers, and on-site waste management activities. In lieu of Form R, the short form (Form A) may be used, provided certain criteria are met. After a facility determines that it must report on a given chemical, the facility is eligible to use Form A for that chemical if:

1. The sum of the annual releases, transfers, and wastes managed on-site (known as the "reportable amount") does not exceed 500 pounds, and,
2. The total annual amount of the chemical manufactured, processed, or otherwise used does not exceed 1,000,000 pounds.

Form A, initiated in the 1997 reporting year, is a two-page report that provides facility information (essentially the same as Form R) and the identification of the chemical, but does not provide any release, transfer, or waste management data.

# Recent Developments in TRI Reporting

The TRI reporting requirements change as EPA seeks to improve the program through changes to the list of reportable chemicals and through program expansions. As a result of these changes, considerable caution must be exercised when comparing TRI data from previous years. Some of the data presented later in this report will be adjusted for these changes in order to present the data on a more constant reporting basis from year to year. Notations will be made to indicate which data is presented with these adjustments.

In the future, the four-digit facility SIC codes will be phased out and replaced with six-digit NAICS (North American Industry Classification System) codes. Facilities will not be added or removed from the reporting requirements because of this change.

# Persistent, Bioaccumulative, Toxic (PBT) Chemicals

For reporting year 2000 and beyond, EPA established substantially lower reporting thresholds for 15 chemicals and three chemical categories that are highly persistent and bioaccumulative in the environment (PBT's). Five chemicals were also added to the PBT list in 2000. The new thresholds apply regardless of whether the PBT chemical is manufactured, processed, or otherwise used. Table 2 provides a list of these PBT chemicals and their thresholds.

Beginning with reporting year 2001 and beyond, lead and lead compounds also have a reduced threshold of 100 pounds, down from the previous 25,000 pounds for manufactured and processed and 10,000 pounds otherwise used thresholds, except lead contained in stainless steel, brass, or bronze alloys.

**TABLE 2**
**PBT CHEMICALS AND REPORTING THRESHOLDS**
**(pounds/year)**

| Chemical or Chemical Category | Threshold |
|---|---|
| Aldrin | 100 |
| Benzo[g,h,I]perylene | 10 |
| Chlordane | 10 |
| Dioxin and dioxin-like compounds | 0.1 grams |
| Heptachlor | 10 |
| Hexachlorobenzene | 10 |
| Isodrin | 10 |
| Lead * | 100 |
| Lead compounds * | 100 |
| Mercury | 10 |
| Mercury compounds | 10 |
| Methoxychlor | 100 |
| Octachlorostyrene | 10 |
| Pendimethalin | 100 |
| Pentachlorobenzene | 10 |
| Polychlorinated biphenyls (PCB's) | 10 |
| Polycyclic aromatic compounds | 100 |
| Tetrabromobisphenol A | 100 |
| Toxaphene | 10 |
| Trifluralin | 100 |

* Lower Threshold Beginning with 2001 Reports

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead is listed as a possible carcinogen by the International Agency for Research on Cancer. Additional release information on all PBT's reported to the Delaware TRI program can be found starting on page 36.

# Industry Expansion

On May 1, 1997, EPA added seven industries to the list of facilities covered under TRI. Prior to the 1998 reporting year, only manufacturers (SIC codes 20XX-39XX) and federal facilities were required to report (See Table 1 on page 2). EPA included the seven new industries because facilities within these industries manufacture and use substantial quantities of TRI chemicals and engage in activities related to those conducted by manufacturing facilities. The greatest impact to Delaware is the Electric Utilities (4931). The industry expansion significantly increased the amount of reported releases. This did not necessarily represent an increase in

toxic releases in Delaware, but rather additional information that was made available to the public. Again, some of the data presented later in this report will be adjusted for these changes in order to present the data on a more constant reporting basis from year to year.

## Chemical List Changes

The number of reportable chemicals substantially increased for the 1995 reporting year and beyond, including the addition of over 200 chemicals and six chemical categories. In response to the increased reporting burden on industry resulting from the chemical list expansion of 1995, EPA initiated the use of Form A described on page 2. The only recent significant deletion was phosphoric acid in 1999. It was reported by 11 facilities in 1998.

## Carcinogenic TRI Chemicals

### TABLE 3
### CARCINOGENS REPORTED BY DELAWARE FACILITIES FOR 2002

| CHEM NAME | IARC | NO. OF REPORTS |
|---|---|---|
| ACRYLONITRILE | 2A | 1 |
| ASBESTOS (FRIABLE) | 1 | 1 |
| BENZENE | 1 | 7 |
| 1,3-BUTADIENE | 2A | 2 |
| CHLOROFORM | 2B | 1 |
| CHROMIUM COMPOUNDS | 1 | 7 |
| COBALT COMPOUNDS | 2B | 3 |
| DI(2-ETHYLHEXYL) PHTHALATE | 2B | 1 |
| DICHLOROMETHANE | 2B | 1 |
| 1,3-DICHLOROPROPYLENE | 2B | 1 |
| DIETHYL SULFATE | 2A | 1 |
| ETHYL ACRYLATE | 2B | 2 |
| ETHYLBENZENE | 2B | 5 |
| ETHYLENE OXIDE | 1 | 2 |
| FORMALDEHYDE | 2A | 1 |
| HEXACHLOROBENZENE | 2B | 1 |
| LEAD | 2B | 7 |
| LEAD COMPOUNDS | 2B | 14 |
| 4,4'-METHYLENEBIS(2-CHLOROANILINE) | 2A | 1 |
| NICKEL | 2B | 2 |
| NICKEL COMPOUNDS | 1 | 7 |
| NITROBENZENE | 2B | 1 |
| P-CHLOROANILINE | 2B | 1 |
| POLYCHLORINATED BIPHENYLS (PCB) | 2A | 1 |
| POLYCYCLIC AROMATIC COMPOUNDS | 2A,B | 14 |
| PROPYLENE OXIDE | 2B | 1 |
| STYRENE | 2B | 7 |
| TETRACHLOROETHYLENE | 2B | 1 |
| TOLUENE DIISOCYANATE (MIXED ISOMER | 2B | 2 |
| TRICHLOROETHYLENE | 2A | 3 |
| VINYL ACETATE | 2B | 2 |
| VINYL CHLORIDE | 1 | 2 |
| | TOTAL = | 103 |

Some chemicals are reportable under TRI because they are either known or suspected human carcinogens. Known human carcinogens are those that have been shown to cause cancer in humans. Suspected carcinogens are those that have been shown to cause cancer in animals. Table 3 contains those known and suspected carcinogens that were reported by Delaware facilities for 2002. Next to each chemical is its International Agency for Research on Cancer (IARC) rating as a: Known (1), Probable (2A), or Possible (2B) carcinogen. Polycyclic aromatic compounds is a class of chemicals with chemicals in both 2A and 2B IARC classifications. Of the 8.0 million pounds of TRI chemicals reported by facilities as released on-site to the environment in 2002, 7.5% (602,000 pounds) were known or suspected carcinogens. Releases on-site of all carcinogens increased 9% over the 2001 data, but decreased 30% since its peak in 1998. For additional information on cancer rates and causes, please go to the Public Health cancer web site listed in the “For Further Information” section on page 46. The Trend Analysis section on page 44 presents additional carcinogen detail.

# Pollution Prevention/Reduction Programs in Delaware

The Delaware Pollution Prevention Program in the Department of Natural Resources and Environmental Control (DNREC) facilitates the implementation of pollution prevention by industry, government and society. The Pollution Prevention Program (P2 Program) serves a non-regulatory function to provide information, technical assistance, training, and leadership on issues related to reducing and eliminating our generation of wastes and pollutants. The early years of the P2 program concentrated on industry and its wastes. In recent years the program has assisted all aspects of Delaware's society, including expanded efforts to schools, environmental organizations, commercial and service businesses, and to state government itself.

Data for TRI reportable chemicals and other chemicals is becoming increasingly more available to the public. This public awareness has focused attention on the existence and quantity of these chemicals and on their management and possible reduction. Although EPCRA does not require a facility to reduce releases of chemicals reportable under its programs, many companies and facilities have implemented programs to reduce or eliminate releases of these chemicals. These programs may take the form of efficiency improvements, reuse, recycling, energy recovery, or material substitutions. The benefits of these programs are reduced raw material and waste disposal costs and reduced risks associated with the toxic chemicals. Also, these reductions demonstrate corporate responsibility to the facility neighbors, and improve the corporate image with the public.

There are numerous programs within DNREC that impact the management of TRI chemicals through the issuance of permits or through other regulatory and non-regulatory activities. Most releases reported under TRI are also regulated through air emission, water discharge, and/or land disposal permits. Potential sources of toxics undergo technical reviews through which potential threats to the environment and to human health are reviewed prior to issuance of a permit. For example, the Engineering and compliance Branch in the Air Quality Management Section enforces a provision in the Clean Air Act Amendment of 1990 that targets the control of hazardous air pollutants (HAPs). Nearly all HAPs are also reportable TRI chemicals. In addition, the Engineering and Compliance staff monitors TRI data to assess whether a facility complies with its Air Permits for TRI chemicals. Another example is the work performed by the Accidental Release Prevention (ARP) program. The ARP staff uses the TRI data to detect possible deficiencies at a facility that might result in an increased probability of an accidental release.

The Solid and Hazardous Waste Management Branch uses the TRI report to measure reductions of releases for the Waste Minimization Priority Chemicals list. The list is a result of EPA's Waste Minimization Program and has measurable goals that Delaware is working to attain. The DNREC Pollution Prevention program offers Consultations to any generator of hazardous waste that requests it. The consultation is non-regulatory and non-enforcement in nature, aimed at helping the company to reduce any and all waste streams, including the priority chemicals.

During 2002, DNREC's Air Quality Management Section monitored ambient air quality at 10 locations around the state. For more information, please refer to the "For Further Information" section under the 2002 Delaware Air quality Report on page 47 of this report.

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# Limitations of TRI Data

The user of TRI data should be aware of its limitations in order to accurately interpret its significance.

- **NOT ALL FACILITIES ARE REQUIRED TO REPORT.** Only a small fraction of facilities in Delaware are required to report under TRI due to the criteria listed on pages 1 and 2.
- **OTHER SOURCES NOT COVERED UNDER TRI ALSO RELEASE TOXIC CHEMICALS.** Other sources include small businesses, motor vehicles, and agricultural operations, as examples. For some chemicals, their use as consumer products is a significant source of releases.
- **FACILITIES ARE ALLOWED TO BASE TRI DATA ON MEASUREMENTS AND MONITORING DATA IF THESE ARE AVAILABLE**. If such data is not available, quantities are estimated based on published emission factors, mass balance calculations, or good engineering judgment. Additional monitoring equipment and measurements are not required.
- **THE DATA ESTIMATION METHODS MAY CHANGE OR VARY.** The methods of estimating, analytical methodology, or basis of calculating data used by different facilities, or even the same facility over time, may vary, and may result in significant changes in reporting while the actual release may remain relatively unchanged. DNREC performs cross-checks of the data with other information sources to verify its accuracy, and contacts facilities concerning apparent discrepancies.
- **REVISIONS TO FORM R MAY OCCUR AT ANY TIME.** These revisions sometimes involve significant changes for data previously reported by a facility.
- **THIS DATA DOES NOT INDICATE AMOUNT OF HUMAN EXPOSURE.** An important consideration to keep in mind is that TRI does not provide an indication of potential exposure to the reported releases and cannot be used by itself to determine the impact on public health. The chemical's release rate, toxicity, and environmental fate, as well as local meteorology and the proximity of nearby communities to the release must be considered when assessing exposures. Small releases of highly toxic chemicals may pose greater risks than large releases of less toxic chemicals. The potential for exposure increases the longer the chemical remains unchanged in the environment. Some chemicals may quickly break down into less toxic forms, while others may accumulate in the environment, becoming a potential source of long term exposure. The chemical exposure of a population depends on the environmental media (air, water, land) into which the chemical is released. The media also affects the type of exposure possible, such as inhalation, dermal exposure, or ingestion.

Despite these limitations, TRI serves as a screening tool to identify areas of concern that may require further investigation.

# 2002 Data Summary

Statewide totals of reported 2002 TRI on-site releases, off-site transfers, and wastes managed on-site are provided in Table 4. On-site releases were lower by 3.6% compared to 2001. A total of 84 facilities submitted 372 reports on 106 different chemicals. Of the 372 reports, 55 were submitted using form A. Toluene, zinc compounds, polycyclic aromatic compounds, lead compounds, methanol, and ammonia all had greater than 10 reports. As in past years, air releases, led by acid gasses, constitute the largest portion of the total on-site releases.

**TABLE 4**
**2002 TRI DATA SUMMARY**
**(IN POUNDS)**

| | 2002 |
|---|---|
| No. of facilities | 84 |
| No of Form A's | 55 |
| No of Form R's | 317 |
| No. of Chemicals | 106 |
| On-site Releases | |
| Air | 6,295,850 |
| Water | 928,813 |
| Land | 814,385 |
| Total Releases | 8,039,048 |
| Off-site Transfers | |
| POTW's | 1,201,161 |
| Recycle | 9,248,730 |
| Energy Recovery | 2,538,090 |
| Treatment | 398,572 |
| Disposal | 4,196,691 |
| Total Transfers | 17,583,245 |
| On-site Waste Mgmt. | |
| Recycle | 25,033,817 |
| Energy Recovery | 15,740,469 |
| Treatment | 33,376,885 |
| Total on-site Mgmt. | 74,151,170 |
| Total Waste | 99,773,463 |

## Types of Data

Table 4 lists all the categories of data reported to Delaware and EPA under the TRI program. Within the actual reports from facilities, the data is broken down into additional sub-categories. For ease of presentation in this report, the data has been grouped into these categories as described below.

On-Site Releases: There are four categories, but no **underground injection** of chemical waste to wells is permitted in Delaware. On-site releases in Delaware are to **air, water,** or **land**. The **air** release category includes stack air collected by mechanical means such as vents, ducts, or pipes, and fugitive air escaping collection and released into the general atmosphere, including equipment leaks and evaporation. **Water** releases are to streams or water bodies, including streams, rivers, lakes, bays, or oceans. This includes releases from contained sources, such as industrial process outflow or open trenches. Water releases include TRI-reportable chemicals in runoff, including storm water runoff, are also reportable. **Land** releases (5 types) are to RCRA landfills, in which wastes are buried, surface impoundments, which are uncovered holding areas used to volatilize and/or settle waste materials, other land disposal such as waste piles or releases to land such as spills or leaks, land application/treatment in which waste containing a listed chemical is applied to or incorporated into soil, and other non-RCRA landfill.

Off-Site Transfers: Off-site transfers include transfer of chemical waste to **POTW"s** (Wastewater Treatment Plants), to **recycle** operations (5 types), to **energy recovery** operations (2 types), to **treatment** operations (6 types), and to **disposal** (12 types), to facilities not at the facility generating the waste. This total of 23 sub-categories is provided for the purpose of classifying the types of final off-site waste management undertaken for each chemical.

On-site waste Management: Waste management operations at the facility generating the waste are categorized to include **recycle**, **energy recovery**, and **treatment.** These are as described above in Off-Site Transfers.

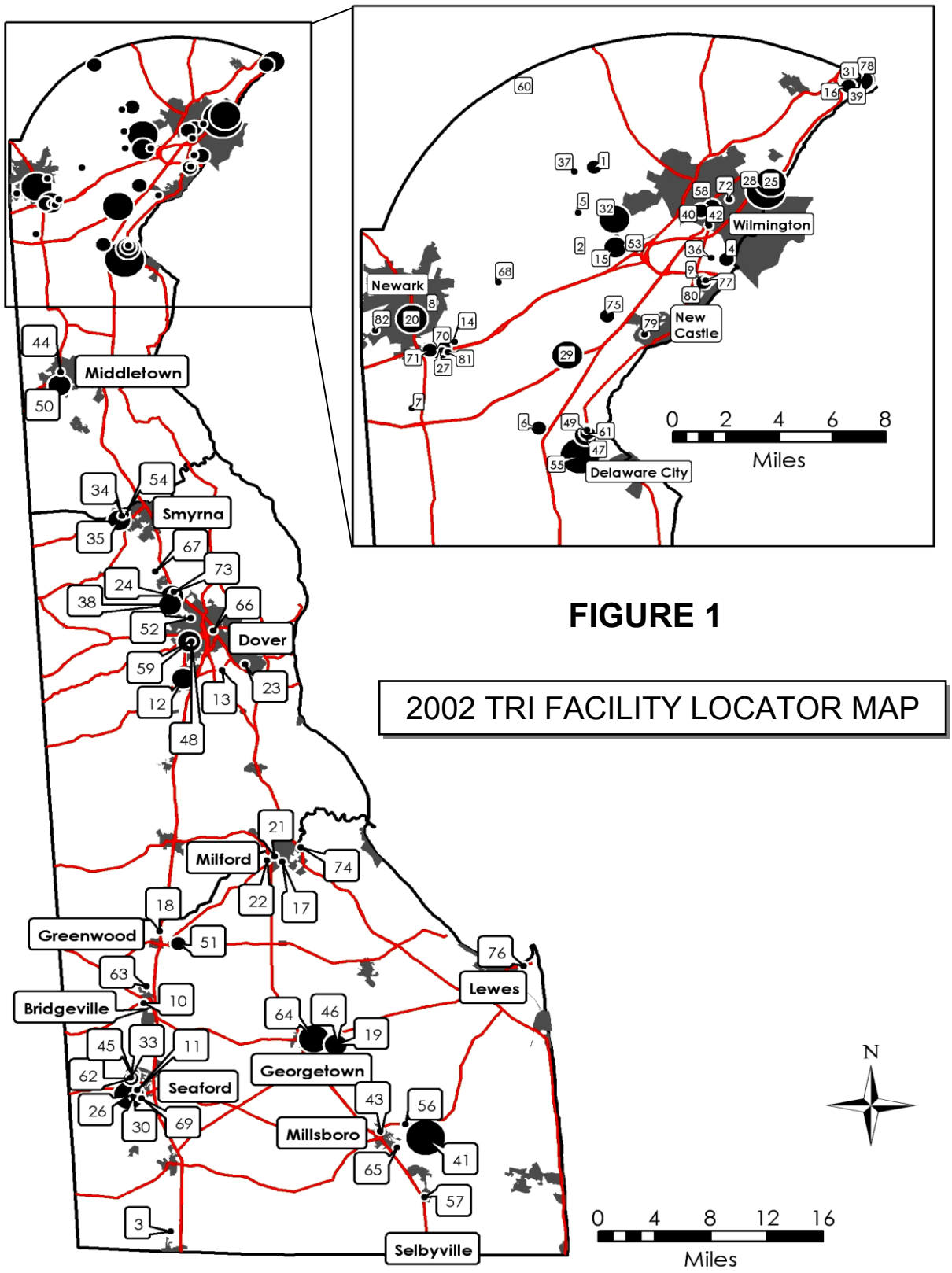



**FIGURE 1**

2002 TRI FACILITY LOCATOR MAP

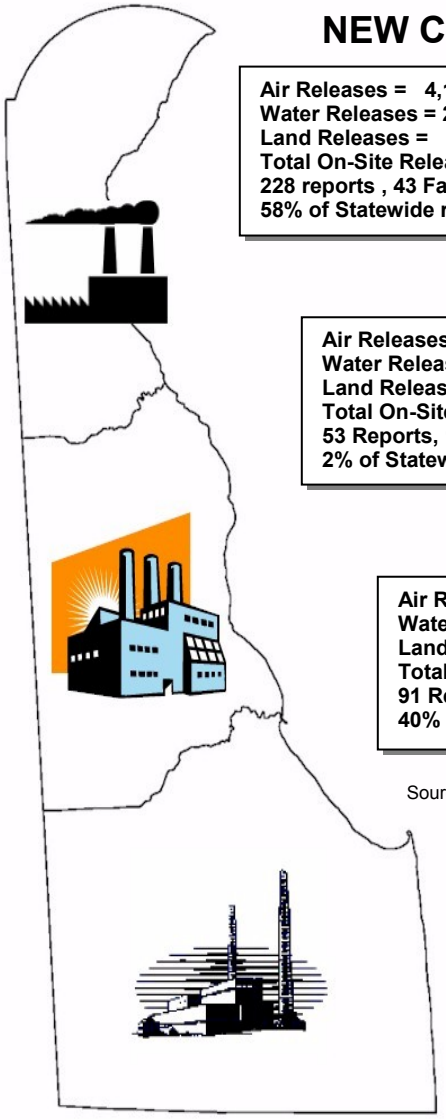
## FIGURE 1 MAP KEY

| MAP ID | FACILITY |
|---|---|
| 1 | AGILENT TECHNOLOGIES LITTLE FALLS |
| 2 | AGILENT TECHNOLOGIES NEWPORT |
| 3 | ALLEN'S HATCHERY |
| 4 | AMERICAN MINERALS |
| 5 | AMETEK |
| 6 | ARLON |
| 7 | ASTROPOWER PENCADER |
| 8 | ASTROPOWER SOLAR PARK |
| 9 | AVECIA |
| 10 | BIRDS EYE FOODS |
| 11 | BLADES BULK PLANT |
| 12 | CAMDEL METALS |
| 13 | CARL KING |
| 14 | CHROME DEPOSIT |
| 15 | CIBA SPECIALTY CHEMICALS |
| 16 | CITISTEEL |
| 17 | CLARIANT |
| 18 | CUSTOM DECORATIVE MOLDINGS |
| 19 | D & B INDUSTRIAL GROUP |
| 20 | DAIMLER CHRYSLER |
| 21 | DENTSPLY CAULK MAIN |
| 22 | DENTSPLY CAULK WEST |
| 23 | DOVER AIR FORCE BASE |
| 24 | DOW REICHHOLD |
| 25 | DU PONT EDGE MOOR |
| 26 | DU PONT SEAFORD |
| 27 | E-A-R SPECIALTY COMPOSITES |
| 28 | EDGE MOOR/HAY RD. POWER PLT. |
| 29 | FORMOSA PLASTICS |
| 30 | GAC SEAFORD |
| 31 | GENERAL CHEMICAL |
| 32 | GENERAL MOTORS |
| 33 | GREEN TREE CHEMICAL |
| 34 | HALKO MANUFACTURING |
| 35 | HANOVER FOODS |
| 36 | HARDCORE COMPOSITES |
| 37 | HERCULES RESEARCH CENTER |
| 38 | HIRSH INDUSTRIES |
| 39 | HONEYWELL |
| 40 | IKO PRODUCTION |
| 41 | INDIAN RIVER POWER PLANT |
| 42 | INSTEEL WIRE |
| 43 | INTERVET |
| 44 | JOHNSON CONTROLS |
| 45 | JOHNSON POLYMER |
| 46 | JUSTIN TANKS |
| 47 | KANEKA |
| 48 | KRAFT FOODS |
| 49 | KUEHNE CHEMICAL |
| 50 | MACDERMID |
| 51 | MARBLE WORKS |
| 52 | MCKEE RUN POWER PLANT |
| 53 | MEDAL |
| 54 | METAL MASTERS |
| 55 | MOTIVA |
| 56 | MOUNTAIRE FARMS FEEDMILL |
| 57 | MOUNTAIRE FARMS OF DELAWARE |
| 58 | NORAMCO |
| 59 | NRG DOVER |
| 60 | NVF YORKLYN |
| 61 | OCCIDENTAL CHEMICAL |
| 62 | ORIENT |
| 63 | PERDUE BRIDGEVILLE |
| 64 | PERDUE GEORGETOWN |
| 65 | PINNACLE FOODS |
| 66 | PLAYTEX PRODUCTS |
| 67 | PPG DOVER |
| 68 | PPG INDUSTRIES |
| 69 | PROCINO PLATING |
| 70 | RODEL |
| 71 | RODEL TECH CENTER |
| 72 | ROLLER SERVICE |
| 73 | SERVICE ENERGY DOVER |
| 74 | SERVICE ENERGY MILFORD |
| 75 | SPATZ FIBERGLASS |
| 76 | SPI PHARMA |
| 77 | SPI POLYOLS, INC. |
| 78 | SUNOCO |
| 79 | TFL USA/CANADA |
| 80 | UNIQEMA |
| 81 | VP RACING FUELS |
| 82 | W.L. GORE OTTS CHAPEL |

Figure 1 on the facing page provides the location of each reporting facility in the state. The size of the facility location marker depicts the relative size of its on-site release relative to other facilities in the state. The facility location, telephone number, and contact person is provided in Appendix B. Figure 2 below provides basic on-site release information for each county.

## FIGURE 2

## ON-SITE RELEASES BY COUNTY



### NEW CASTLE

**Air Releases = 4,171,833 Pounds**
**Water Releases = 232,685 Pounds**
**Land Releases = 307,118 Pounds**
**Total On-Site Releases = 4,711,636 Pounds**
**228 reports , 43 Facilities**
**58% of Statewide releases**

### KENT

**Air Releases = 125,594 Pounds**
**Water Releases = 0 Pounds**
**Land Releases = 0 Pounds**
**Total On-Site Releases = 125,594 Pounds**
**53 Reports, 16 Facilities**
**2% of Statewide releases**

### SUSSEX

**Air Releases = 1,998,423 Pounds**
**Water Releases =696,128 Pounds**
**Land Releases = 507,267 Pounds**
**Total On-Site Releases = 3,201,818 Pounds**
**91 Reports, 25 Facilities**
**40% of Statewide releases**

Source: DNREC 2002 TRI Database 3-1-04

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# SIC Industry Groups

Table 5 provides a description of each Standard Industrial Classification (SIC) industry group and the number of facilities in each group that reported in Delaware. This table also provides on-site releases, off-site transfers, and wastes managed on-site for each group. All three power plants (SIC 4911) reporting in Delaware combust coal. The one reporting metal mining facility, American Minerals, processes metal ores that they receive by railcar. Lead and lead compounds used reduced thresholds starting in 2001, and 14 new facilities began reporting then. Reporting year 2000 included seven facilities in industry codes 10, 28, 33, 34, 36, and 37, and these facilities continue to report lead and lead compounds. The number of facilities reporting lead and lead compounds remains steady with 21 facilities reporting in 2002.

**TABLE 5**
**2002 TRI DATA BY PRIMARY SIC GROUP**

(in pounds)

| SIC CODE | INDUSTRY GROUP | NUMBER OF REPORTS | NUMBER OF FACILITIES | FORM A | FORM R | ON-SITE RELEASE | OFF SITE TRANSFERS | ON-SITE WASTE MGMT. |
|---|---|---|---|---|---|---|---|---|
| 10 | Metal Mining | 5 | 1 | | 5 | 6,274 | 0 | 0 |
| 20 | Food Products | 22 | 9 | 12 | 10 | 560,967 | 1,120 | 10,000 |
| 22 | Textiles | 5 | 2 | 0 | 5 | 34,094 | 789,775 | 3,235,300 |
| 25 | Furniture and Fixtures | 1 | 1 | | 1 | 12,612 | 0 | 0 |
| 26 | Paper Products | 1 | 1 | | 1 | 8,013 | 11,914 | 4,270,402 |
| 28 | Chemicals | 127 | 26 | 12 | 115 | 1,135,452 | 7,963,064 | 33,212,209 |
| 29 | Petroleum Refining and Products | 64 | 5 | 6 | 58 | 1,452,125 | 167,856 | 19,018,857 |
| 30 | Rubber and Plastics | 14 | 11 | 3 | 11 | 67,832 | 76,169 | 123,104 |
| 32 | Stone, Clay and Glass | 1 | 1 | | 1 | 0 | 750 | 0 |
| 33 | Primary Metal | 13 | 4 | | 13 | 17,167 | 2,441,193 | 13,100,000 |
| 34 | Fabricated Metal Products | 5 | 3 | | 5 | 20 | 108,803 | 18,720 |
| 36 | Electronic equipment, except computers | 6 | 3 | | 6 | 730 | 4,571,788 | 64,920 |
| 37 | Transportation Equipment | 35 | 3 | 1 | 34 | 656,260 | 1,051,926 | 125,194 |
| 38 | Measuring instruments, medical/optical goods | 10 | 4 | | 10 | 2,087 | 89,915 | 270 |
| 39 | Miscellaneous Manufactuing | 1 | 1 | | 1 | 2,371 | 0 | 0 |
| 4911 | Oil and Coal Fired Power Plants | 42 | 4 | 2 | 40 | 4,083,044 | 308,972 | 972,194 |
| 5171 | Wholesale Petroleum Terminals | 19 | 4 | 19 | 0 | 0 | 0 | 0 |
| 97 | National Security | 1 | 1 | | 1 | 1 | 0 | 0 |
| | TOTAL | 372 | 84 | 55 | 317 | 8,039,048 | 17,583,245 | 74,151,170 |

**FIGURE 3**
**2002 ON SITE RELEASES BY SIC**

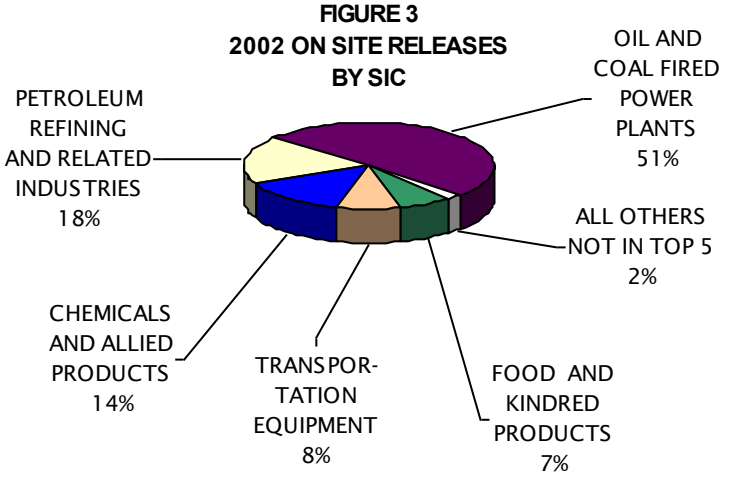


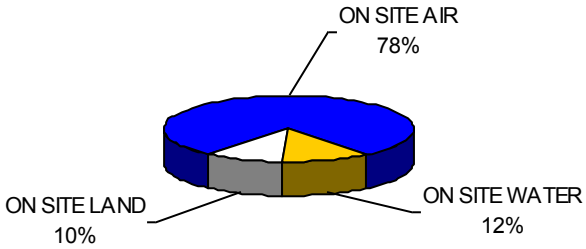

Figure 3 shows the relative contribution of each of the top 5 SIC groups to the total on-site releases and all others not in the top 5. Three of these - SIC groups 4911 (Oil and Coal Fired Power plants), 29 (Petroleum refining), and 28 (Chemicals) combined for 83% of the total on-site releases within the state. Facilities not in the top 5 industry groups contributed only 151,200 pounds on-site, or less than 2% of the total.

# On- Site Releases

On-site releases are emissions from a facility to the environment because of normal operations, including emissions to the air, discharges to surface water, disposal onto or into the ground, and underground injection. Although underground injection is an approved method for disposal is some states, it not an approved method of hazardous waste disposal in Delaware, and thus has not been reported by any facility in Delaware since reporting began. Total on-site releases to air, water, and land make up about 8% of all TRI-reported wastes.

Figure 4 shows the on-site releases reported in the state. A large portion, 78 percent, of the total on-site release is to air. Additional analysis of on-site releases is presented in Figures 5, 6, and 7 below, showing the top 15 chemicals and their releases to air, water, and land.

**FIGURE 4**
**2002 ON SITE RELEASES**

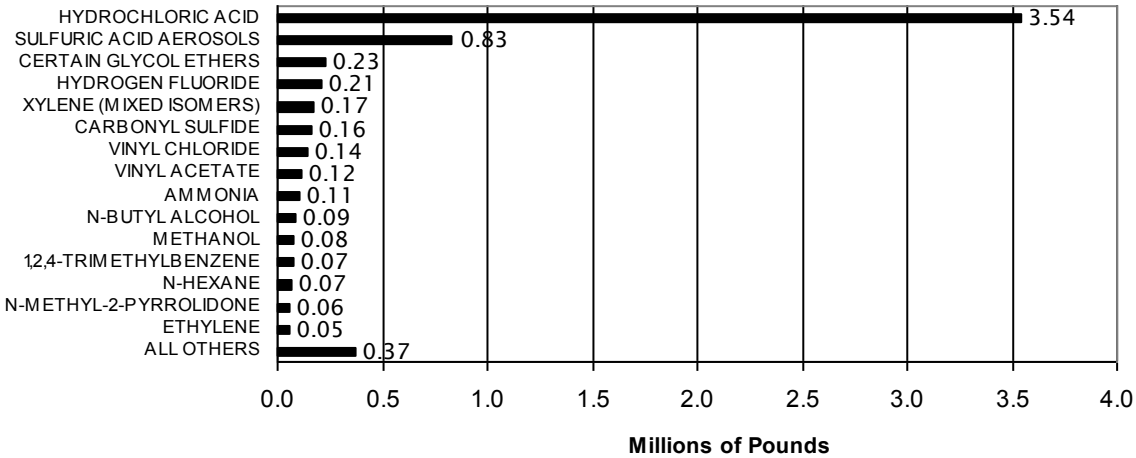



TOTAL: 8,039,048 POUNDS

## Releases to Air

Figure 5 provides an illustration of the relative release of the top 15 chemicals compared to the other 72 chemicals reported as released in 2002 to the air. As in all the years following the inclusion of power generating facilities, acid gasses top the list. Specifically, hydrochloric and sulfuric acid aerosols (gasses) and hydrogen fluoride are released from power generating facilities located in all three counties. These three chemicals comprise 73% of statewide air

**FIGURE 5**
**TOP 15 CHEMICALS RELEASED TO AIR**



releases. Nine facilities reported xylene, which represents 3% of all on-site releases to air. Xylene is primarily used as a solvent in paints for the automobile manufacturing industry. The two automobile manufacturing facilities in Delaware accounted for 92% of the xylene air releases. A similar condition exists for certain glycol ethers (4% of on-site air releases), where the automotive manufacturing industry accounted for over 94% of the releases from eight reporting facilities.

## Releases to Water

As can be seen in Figure 4 on page 11, releases to water were much lower than releases to air. Table 6 provides the amount of TRI chemicals released to each receiving stream that received a TRI chemical. Figure 6 on the next page shows that nitrate compounds was the top chemical released (75% of the total water release), followed by cresol mixed isomers (6%), phenol (5%), and manganese compounds (4%). The biological treatment of nitrogen-containing compounds such as animal waste and ammonia is responsible for the formation of nitrate compounds. Perdue Georgetown and DuPont Seaford were the primary reporters of nitrate compounds released to the Savannah Ditch (Perdue Georgetown), and Nanticoke River (DuPont Seaford). Motiva was the only reporter of Cresol mixed isomers, a by-product of refining. DuPont Edge Moor and Motiva reported all but 1,111 pounds of manganese compounds released to the Delaware River. DuPont Edge Moor reported 90% of the total manganese release to water with 34,910 pounds, followed by Motiva with 7.5%, or 2,900 pounds. Manganese compounds are formed from ore refining and from impurities in coal used in the power generating facilities.

**TABLE 6**
**RELEASES TO WATER BY RECEIVING STREAM**

| NAME | NO. OF FACILITIES | NO. OF REPORTS | RELEASE (IN POUNDS) |
|---|---|---|---|
| DELAWARE RIVER | 7 | 57 | 224,427 |
| DRAWYER CREEK TRIB. | 1 | 1 | 5 |
| INDIAN RIVER | 1 | 1 | 120 |
| LITTLE MILL CREEK | 1 | 1 | 200 |
| NAAMANS CREEK | 1 | 6 | 40 |
| NANTICOKE RIVER | 1 | 3 | 146,008 |
| RED CLAY CREEK | 1 | 1 | 8,013 |
| SAVANNAH DITCH | 1 | 1 | 550,000 |
| STATE TOTAL | 14 | 71 | 928,813 |

Not every report shows a release to its listed watershed. For example, of the 75 reports listing the Delaware River as their destination watershed, only 57 reports show an actual release quantity to the Delaware River. The other 18 met the reporting requirements listed on page 1 and had the potential to release to the river or may have released chemicals to other media (air or land), but did not report any amounts actually released to the river.

**TABLE 7**
**RELEASES TO WATER BY BASIN**

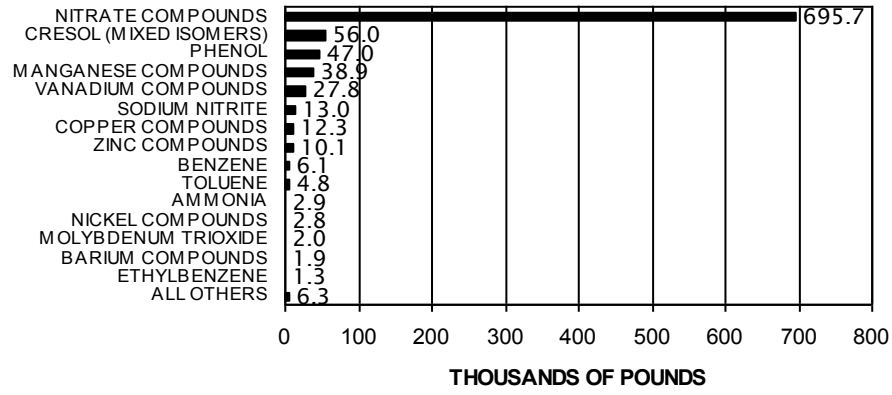
| BASIN | RELEASE (IN POUNDS) | PERCENT |
|---|---|---|
| CHESAPEAKE | 146,008 | 16% |
| DE BAY | 719,013 | 77% |
| INLAND BAYS | 120 | 0.01% |
| PIEDMONT | 63,672 | 7% |
| STATE TOTAL | 928,813 | 100% |

Table 7 provides the total amount of TRI chemicals released to each basin in the state of Delaware. The Piedmont Basin contains lands that drain into the portion of the Delaware River above New Castle, and the Inland bays include lands that drain into the Indian River Bay/Rehoboth Bay area. All the receiving streams except the Nanticoke and Indian Rivers eventually feed into the Delaware Bay. The 361,000 pound increase in releases to the DE bay was caused by the 240,000 pound increase

in nitrate compounds released by Perdue Georgetown, and Motiva contributed a 56,000 pound increase in cresol, a 47,000 pound increase in phenol, and a 16,000 pound increase in vanadium compounds. Additional discussion about these releases can be found in the Trend section starting on page 42.

Figure 6 shows the relative relationship of the top 15 TRI chemicals and the 23 other chemicals reported as released to water. This clearly shows the influence that nitrate compounds had on the total. On-site water releases make up 12% of the total on-site releases.

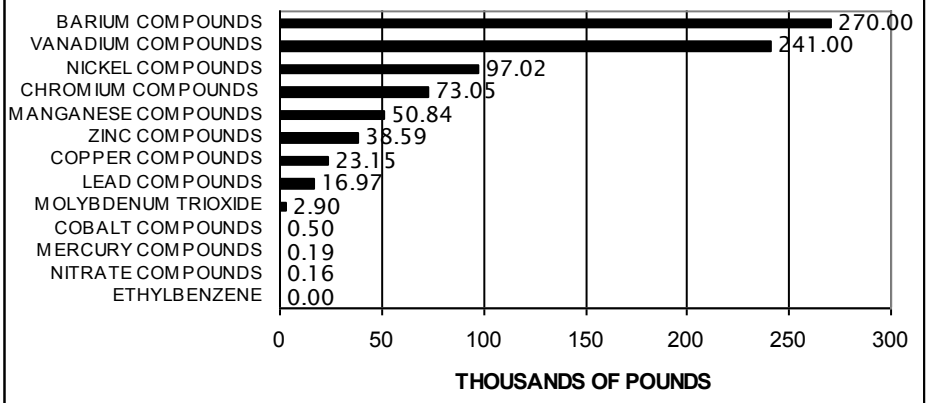
**FIGURE 6**
**TOP 15 CHEMICALS RELEASED TO WATER**




## Releases to Land

Land releases, as shown in Figure 4 on page 11, are relatively small, comprising 10% of the total on-site releases. Figure 7 shows the relative contribution all 13 chemicals reported as being released to land. Nearly all the land releases are metals and metal compounds except for the small quantities of nitrate compounds and ethylbenzene. Most of the metals and metal compounds being reported are formed during the combustion process from metal impurities that exist in coal or crude oil. Barium and vanadium compounds comprise 63% of the total land releases. Land releases, generally the metallic compounds shown above, by the Indian River power plant and Motiva facilities account for 99% of the total land releases.

**FIGURE 7**
**13 CHEMICALS RELEASED TO LAND**



TOXICS RELEASE INVENTORY

## RELEASES FROM THE TOP 15 FACILITIES

**FIGURE 8**
**2002 ON SITE RELEASES**
**TOP 15 FACILITIES**

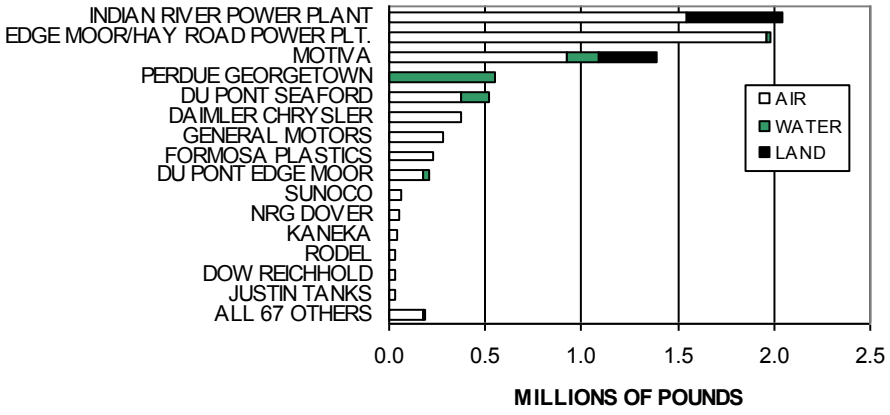



Figure 8 shows the relative contribution of each of the top 15 reporting facilities to on-site releases. The top 3 facilities are, or have as a significant portion of their facility, an energy generating operation. Of the on-site 8,026,409 pounds that were released statewide by all 82 facilities, the top 15 facilities accounted for 7,835,162 pounds, over 97% of the total on-site releases.

## TABLE 8
### TOP 15 FACILITIES 2001 AND 2002 RANKING BY ON SITE RELEASE
**(in pounds)**

| 2001 RANK | 2002 RANK | FACILITY | 2002 TOTAL AIR | 2002 TOTAL WATER | 2002 TOTAL LAND | 2002 TOTAL ON-SITE RELEASE | 2001 TOTAL ON-SITE RELEASE | 2001 TO 2002 CHANGE IN RELEASES |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | INDIAN RIVER POWER PLANT | 1,541,902 | 120 | 504,987 | 2,047,009 | 2,433,625 | -16% |
| 2 | 2 | EDGE MOOR/HAY ROAD POWER PLT. | 1,963,752 | 16,326 | 0 | 1,980,078 | 1,740,371 | 14% |
| 3 | 3 | MOTIVA | 919,528 | 168,986 | 306,542 | 1,395,056 | 1,655,108 | -16% |
| 7 | 4 | PERDUE GEORGETOWN | 0 | 550,000 | 160 | 550,160 | 310,210 | 77% |
| 4 | 5 | DU PONT SEAFORD | 373,593 | 146,008 | 2,120 | 521,721 | 571,057 | -9% |
| 5 | 6 | DAIMLER CHRYSLER | 371,459 | 0 | 0 | 371,459 | 384,450 | -3% |
| 6 | 7 | GENERAL MOTORS | 284,601 | 200 | 0 | 284,801 | 343,664 | -17% |
| 10 | 8 | FORMOSA PLASTICS | 226,402 | 0 | 0 | 226,402 | 116,616 | 94% |
| 8 | 9 | DU PONT EDGE MOOR | 171,472 | 37,570 | 0 | 209,042 | 244,994 | -15% |
| 12 | 10 | SUNOCO | 57,063 | 0 | 0 | 57,063 | 41,825 | 36% |
| 9 | 11 | NRG DOVER | 55,956 | 0 | 0 | 55,956 | 119,019 | -53% |
| 14 | 12 | KANEKA | 36,659 | 1 | 0 | 36,660 | 32,429 | 13% |
| 13 | 13 | RODEL | 34,094 | 0 | 0 | 34,094 | 33,867 | 1% |
| 11 | 14 | DOW REICHHOLD | 33,510 | 0 | 0 | 33,510 | 43,565 | -23% |
| 15 | 15 | JUSTIN TANKS | 32,151 | 0 | 0 | 32,151 | 31,117 | 3% |
| | | ALL 67 OTHERS | 193,708 | 9,602 | 576 | 203,886 | 234,370 | -13% |
| | | TOP 15 | 6,102,142 | 919,211 | 813,809 | 7,835,162 | 8,101,917 | -3.3% |
| | | STATE TOTALS | 6,295,850 | 928,813 | 814,385 | 8,039,048 | 8,336,287 | -3.6% |

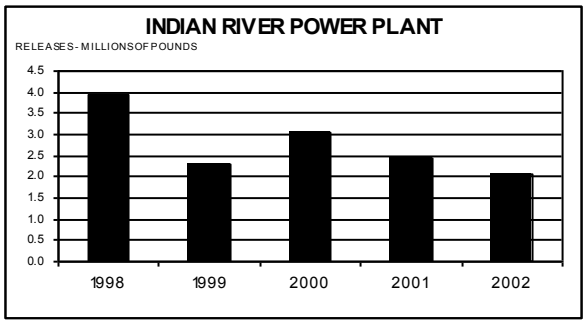
Source: 2001 and 2002 DNREC TRI Databases, February 2004

Table 8 shows the 2002 ranking of the top 15 facilities along with their 2001 ranking and the values of on-site releases for both years. The percent change in total on-site release from 2001 to 2002 is also shown. Releases to the environment as a result of remedial actions, accidents, catastrophic events, or one-time events are not shown here, as these releases are generally not associated with changes in production. Changes in production may or may not affect releases from a facility. Other changes at the facility, such as changes in raw materials or processing methods, placing an idle process or equipment back into operation, or installation of new/improved production equipment possibly used to limit or eliminate releases of all or specific chemicals, may affect releases. Interested individuals are encouraged to contact facilities and inquire as to the reasons why changes occurred.

You may note that some of the rankings have changed since 2001 and/or earlier years, or some facilities have had reductions in their off-site releases and their rank did not change. This is because of the general downward trend of the total group. In order to maintain their rank, individual facilities must keep pace with this trend and effect their reductions at a similar rate. In some cases significant reductions result in little, if any change in rank, and no change in release may result in an increase in rank.

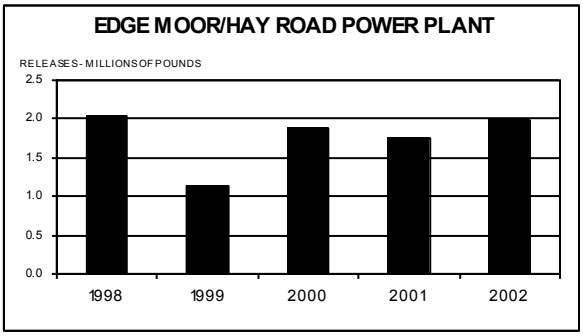
The next several pages present a brief description of each of the top 30 facilities to provide an understanding of the use and importance of some of the TRI chemicals and basic operations at these facilities. As in Table 8, this rank is based on total on-site releases. The facility description describes the types of products manufactured at the facility and how their TRI chemicals relate to the products and the overall plant operation. The graph included with the facility description shows the trend of the facility total on-site releases since 1998, the date of the last major TRI reporting revision. Reporting revisions that have occurred since 1998 include the changes in reporting as described starting on page 3 with the threshold reductions for Persistent, Bioaccumulative Toxics (PBT's) and industry expansion. All newly reportable chemicals within this time have been included. Comparisons must be made carefully as the scales on each of the graphs may be different. Appendix C provides a complete list of 2002 release data grouped by facility and chemical. Again, please contact the facility for additional details or to inquire about any changes in trends or unusual events.

**Rank #1 – NRG Indian River Power Plant** - Oil- and coal-fired power plants were required to report under TRI for the first time for 1998. This facility, located near Millsboro, produces electricity, primarily from the combustion of coal.




The Indian River Plant reported on sixteen TRI chemicals for 2002. Nine of these were metal compounds, three were non-metallic PBT's, one was ammonia, and the remaining three were acid gases. All compounds except ammonia are formed during the combustion process as a result of impurities within the coal. Acid gas emissions - hydrochloric acid, hydrogen fluoride, and sulfuric acid - accounted for 74% of their on-site releases. The metal compounds are largely captured in the fly ash and bottom ash and sent to an on-site landfill. This accounted for 25% of their on-site releases. The facility had a small amount of copper compounds released to the Indian River, and the remainder of the on-site releases was ammonia and the non-metallic PBT's. On-site releases have decreased 48% since 1998.

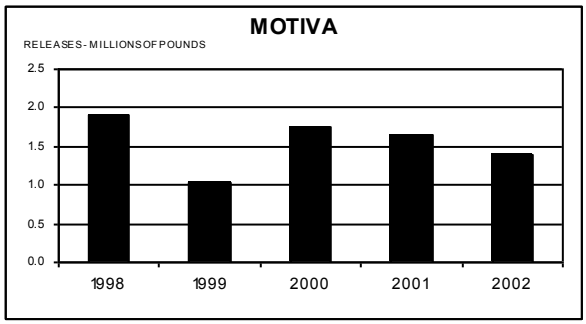
**Rank #2 - Edge Moor/Hay Road Power Plant** - Oil- and coal-fired power plants were required to report under TRI for the first time for 1998. This facility, located along the Delaware River a mile north of the Port of Wilmington, produces electricity from the combustion of coal, oil, and natural gas.




The Edge Moor Plant reported on eighteen TRI chemicals for 2002. This facility reported

three acid gasses, nine metal compounds, three non-metallic PBT's, and ammonia. Acid gas emissions -- hydrochloric acid, hydrogen fluoride and sulfuric acid -- accounted for 97% of on-site releases. Releases of hydrochloric acid and hydrogen fluoride increased from 2001, and sulfuric acid decreased due to changes in the amounts of oil and coal used. Overall, on-site releases increased in 2002 and now are just under the 1998 level. Ammonia is released in the power production process solely from the use of urea, a pollution control agent used for limiting the formation of oxides of nitrogen to the atmosphere. All listed compounds except ammonia are formed during the combustion process because of impurities within the fuel. About 87% of the metal compounds are largely captured in the fly ash and bottom ash. Generally, 100 percent of the captured ash is beneficially reused. It is used, for example, as an additive in concrete, as landfill stabilizer, as flowable fill in construction projects and as a base for road construction. The remaining 13% of metals in ash not captured was released to air and water and accounted for 2% of their on-site releases.

**Rank #3 - Motiva Enterprises -** The Motiva Refinery, located in the Delaware City industrial complex, refines crude oil into automobile gasoline, home heating oil, and a variety of other petroleum products. The facility, previously known as Star Enterprise, changed ownership to Motiva Enterprises on July 1, 1998. Motiva Enterprises, as of February 13, 2002, became a U.S. joint venture between Shell Oil Company and Saudi Refining, Inc.

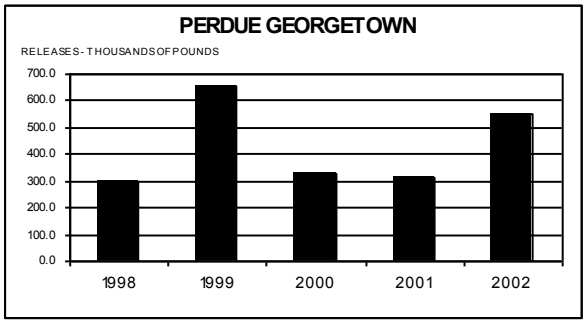



Motiva reported on 47 TRI chemicals for 2002. Their reported on-site releases decreased 16% in 2002 and have decreased 27% since 1998. Sulfuric acid and hydrochloric acid gas emissions accounted for over 50% of Motiva's on-site releases. Sulfuric and hydrochloric acids are formed as acid gasses in several units at the facility, including the Fluid Coker, Fluid Cat Cracker, and the on-site power plant that combusts oil and gas. Reported hydrochloric acid aerosol emissions increased by 11% in 2002. Other increases - cresol (56,000 pounds), phenol (47,000 pounds), and nickel compounds (27,000 pounds) were more than offset by a 39% decrease (330,000 pounds) in sulfuric acid aerosols, along with decreases in vanadium compounds (48,000 pounds) and MTBE (48,000 pounds). The changes in cresol and phenol were due to new information about their existence in the process. The nickel release increased because of increased gassifier operation. The sulfuric acid decrease was a return to a normal level after higher than normal releases in 2000 and 2001. The decrease in vanadium compounds was due to lower concentration in gassifier slag. The reduction in MTBE release was due to a change in the estimation method.

**Rank #4 - Perdue Farms** - Perdue Farms is a producer of poultry products. The Georgetown facility processes chickens for sale to the retail market.

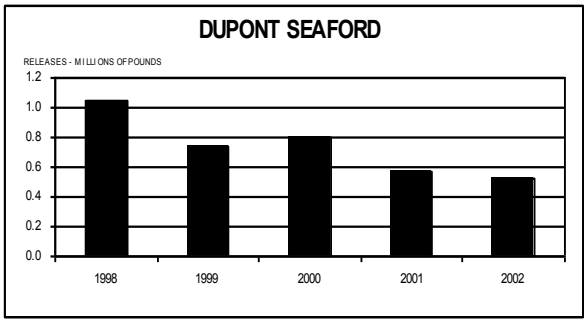
Perdue reported on three TRI chemicals for 2002. The majority of the releases were for nitrate compounds. The Perdue wastewater treatment plant digests ammonia and production waste from the poultry processing plant's wastewater stream and converts some of these wastes to nitrate compounds.

Nitrate compound volume at Perdue's wastewater treatment plant peaked in 1999 when new government-mandated processing plant procedures dramatically increased the amount of water required to process chickens. Improvements in the wastewater treatment plant operation cut nitrate releases by more than 50 percent in 2000 and 2001, but these reductions have been partially offset by recent changes in the way the amount of nitrate compounds releases are estimated.



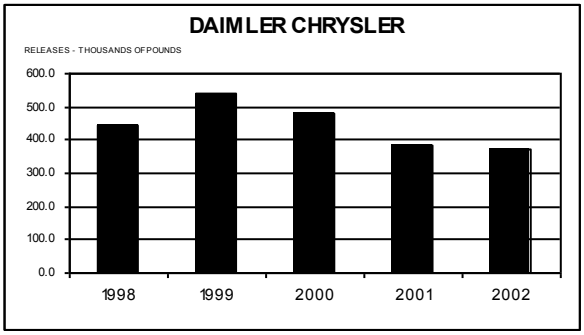

**Rank #5 - DuPont Seaford** - This facility was the first plant worldwide to produce spun nylon fibers, beginning operations in 1939. The spun nylon is used in the apparel industry, in carpeting, and other fabrics applications. The facility also produces nylon flake for export.

DuPont Seaford reported on 13 TRI chemicals for 2002. Almost 97% of their on-site releases were of three chemicals; hydrochloric and sulfuric acids aerosols to air and nitrate compounds to water. Combustion of coal in the DuPont power plant produces hydrochloric and sulfuric acids aerosols released from the stacks. The coal contains small amounts of chlorine- and sulfur-containing compounds that, through the combustion process, convert to acid gases. Nitrate compounds are formed as a by-product of the DuPont on-site process wastewater treatment plant. This facility has reduced its on-site releases by 9% since 2001 and by 50% since 1998.




**Rank #6 - Daimler Chrysler Newark Assembly Plant** - Daimler Chrysler assembles the Dodge Durango SUV for distribution to dealers.

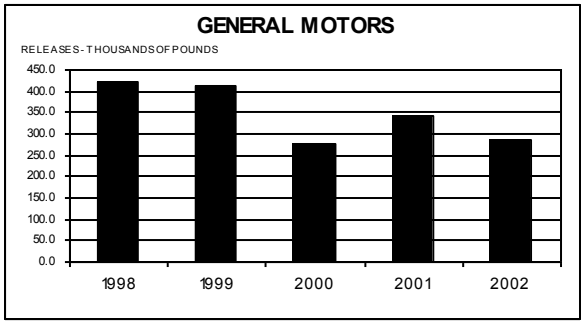
Daimler Chrysler reported on 19 TRI chemicals for 2002. All on-site releases were to the air. Many of these are solvents used in paints or for parts cleaning, while others are materials that are incorporated into the cars themselves, such as ethylene glycol (antifreeze) and methyl tert-butyl ether (gasoline additive). The vehicle body coating process makes use of certain glycol ethers, 1,2,4-trimethylbenzene, methyl isobutyl ketone, n-butyl alcohol, and xylene.



These materials are also used elsewhere in the plant. In total, they account for approximately 85% of the Daimler Chrysler on-site releases for 2002. Daimler Chrysler accounted for about 58% of certain glycol ethers and 22% of all xylene releases in the state in 2002.

This facility has reduced its emissions of on-site TRI reportable chemicals by 16% since 1998, and has realized reductions in off-site transfers and on-site waste management amounts as well.

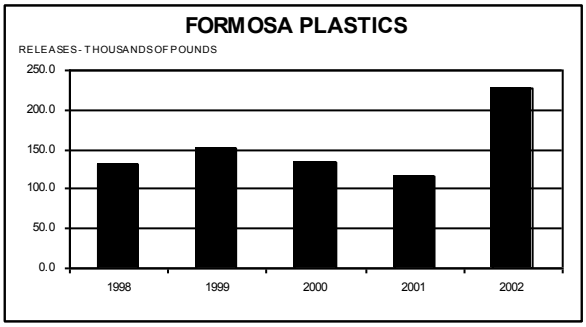
**Rank #7 - General Motors Wilmington Assembly Plant** - General Motors assembles Saturn automobiles for distribution to dealers.




GM reported on 14 TRI chemicals for 2002. Many of these are solvents used in paints or for parts cleaning, while others are materials that are incorporated into the cars themselves, such as methyl tert-butyl ether (gasoline additive). Almost all on-site releases reported by GM were to the air. Xylene, 1,2,4-trimethylbenzene, certain glycol ethers, and paint solvents used in both the base and top coats accounted for over 85% of their on-site releases in 2002. General motors accounted for about 36% of certain glycol ethers and 70% of all xylene releases in the state in 2002.

GM Wilmington reported a 17% decrease in on-site release of TRI chemicals in 2002, and it has reduced its on-site releases of TRI chemicals by 32% since 1998 while increasing production by 20%.

**Rank #8 - Formosa Plastics** - Formosa Plastics, located in the Delaware City complex, produces polyvinyl chloride (PVC) resin for bulk sale to other industries that produce PVC based products, such as containers, flooring, carpet backing, upholstery, toys, and gloves.

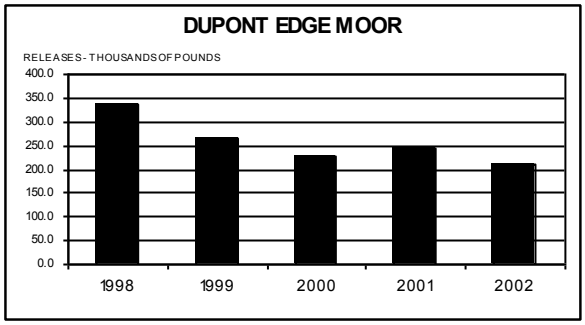



Formosa reported four TRI chemicals for 2002. Vinyl chloride monomer (VCM) accounted for 46% of their on-site releases. VCM is the primary ingredient for producing PVC and is released as residual unreacted monomer during the drying process of the PVC resin. Permits regulate the concentration of the residual monomer in the PVC before drying. Vinyl acetate accounted for 51% of Formosa's on site releases. Vinyl acetate is also a raw material used in certain products and is released through the drying process. Ammonia is also used in several of Formosa's products and is released during the drying process. Ammonia accounted for 3% of Formosa's on site releases. Formosa also reported a small amount of dioxin and dioxin-like compounds for

both on-site releases and off-site transfers. Formosa Plastics also is currently investing funds in a process modification, which when complete should reduce vinyl chloride emissions significantly, although the site currently operates below permitted emission levels. Formosa started using a new basis on which to estimate vinyl acetate releases in 2002, so comparison of 2002 with prior years is not possible. However, on-site releases in 2001 were lower by 12% compared to 1998.

**Rank #9 - DuPont Edge Moor** - The Edge Moor Plant is one of four domestic DuPont facilities that manufactures titanium dioxide, a white pigment that is used in food-grade markets and in the paint, coatings, plastic, and paper industries. This facility exclusively serves the paper industry. The plant is located along the Delaware River a few miles north of the Port of Wilmington.

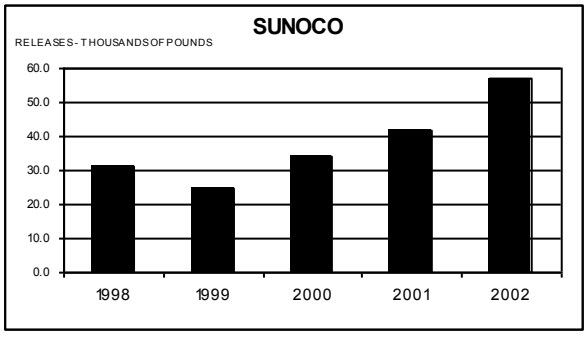
DuPont Edge Moor reported on 22 TRI chemicals for 2002. Carbonyl sulfide accounted for 78% of their on-site releases. Carbonyl sulfide is a by-product produced from the use of sulfur-bearing coke in the process of manufacturing the titanium dioxide from titanium-rich ores.



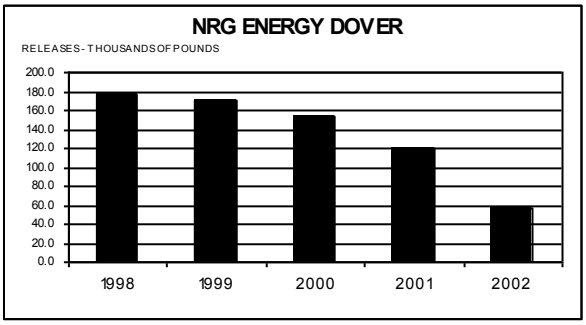

Also, dioxins and dioxin-like compounds are created as a result of ore processing. About 99.8% is contained within the solid material sent to an out-of-state landfill facility.

**Rank #10 – Sunoco Refining and Marketing** – Sunoco, located in Marcus Hook, PA extends its facility into the North Claymont area of Delaware. The Marcus Hook facility can process 175,000 barrels a day of crude oil into fuels – including gasoline, aviation fuel, kerosene, heating oil, residual fuel, propane and butane, and petrochemicals. The major petrochemicals are benzene, toluene, xylene, cyclohexane, propylene, ethylene, and ethylene oxide; these are sold to chemical companies, which use them to make a variety of other products.

The portion of the facility in Delaware reported five TRI chemicals in 2002. Ethylene and ethylene oxide account for 98% of the total Delaware releases. Small amounts of xylene, benzene, and toluene were reported for the first time in Delaware in 2001 and are released to air from tanks. This was the primary reason for the upward trend in 2001. The ethylene release for 2002 increased by 17,000 pounds and was the primary reason for the upward trend in 2002. Ethylene oxide releases, reported for several years in Delaware, have not changed significantly.

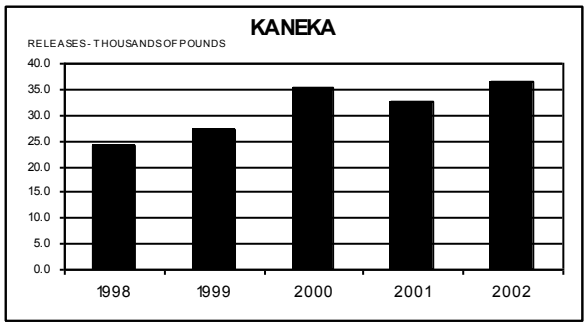


**Rank #11 - NRG Dover Plant** - Oil- and coal-fired power plants were required to report under TRI for the first time for 1998. This facility located on the West side of Dover produces electricity, primarily from the combustion of coal.



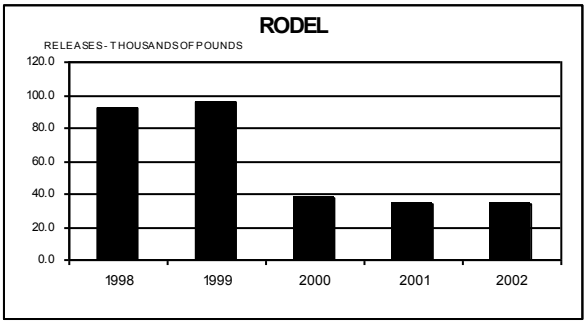

The NRG Dover Plant reported on six TRI chemicals for 2002. Two of these were acid gases formed during the combustion process. Acid gas emissions - hydrochloric acid and sulfuric acid - accounted for over 99% of their on-site releases. Small amounts of metal compounds are formed because of impurities in the coal and are largely captured in the fly ash and bottom ash and sent to an off-site landfill. The decrease in 2002 reported releases was the result of using a new basis for estimating releases of hydrochloric acid aerosols. This new basis reduced the reported release of hydrochloric acid by 65% (63,000 pounds).

**Rank #12 – Kaneka Delaware** – Kaneka, located in the Delaware City complex, manufactures Polyvinyl Chloride (PVC) powder for use in PVC based applications such as inflatable balls, covers, foam carper backing, and similar products.




Kaneka reported two TRI chemicals released in 2002; vinyl chloride and hydrochloric acid. Vinyl chloride represented 99% of the Kaneka on-site releases for 2002. Vinyl chloride was released during the drying operations, when unreacted residual vinyl chloride monomer was removed from the finished powder. Permits regulate the concentration of the residual vinyl chloride monomer in the PVC before drying. Up by 13% over 2001 and operating below permit limits, Kaneka's on-site releases have increased by 52% since 1998.

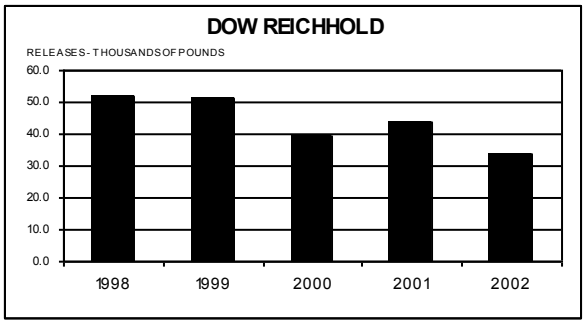
**Rank #13 - Rodel** - Rodel manufactures polishing pads and slurries for the semiconductor, electronics, and glass industries. Rodel is located south of Newark in the Diamond State Industrial Park.




Rodel reported on four TRI chemicals for 2002. N,N-Dimethylformamide (DMF), used as a solvent carrier in the polishing pad manufacturing process, accounted for 68% of their on-site releases. Releases of DMF mostly occur through evaporation from the poromerics coating and washing process. The majority of the DMF used is recycled in

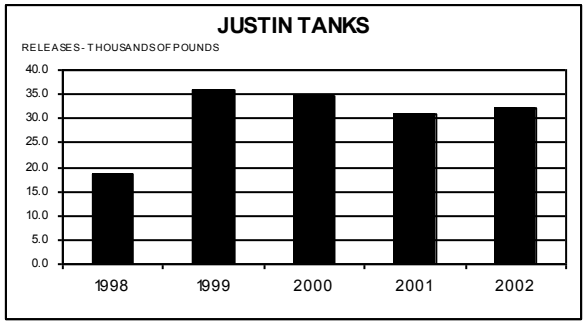
their distillation equipment for reuse in the process. The 2002 DMF release was 31% of the 1998 level. Methyl ethyl ketone (MEK) accounted for 32% of their on-site releases, and is now at 63% of its 1998 level. MEK is used as a solvent carrier in the Impregnation Process. All on-site releases were to air, and were primarily stack emissions from the oxidizer used to control process emissions. Total on-site release was 37% of their 1998 levels.

**Rank #14 - Dow Reichhold** – Dow Reichhold is located two miles south of Cheswold. Dow Reichhold produces emulsion polymers, sometimes referred to as latex. These products are sold in bulk liquid form and are used in the manufacture of paper, carpets, textiles, high performance gloves, coatings, and adhesives.



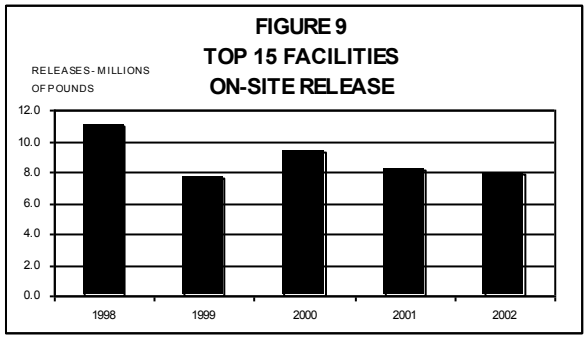

Reichhold reported on 11 TRI chemicals in 2002. Most of these are raw materials used to form the emulsion polymers. Pollution control equipment processed the residual monomers and achieved 98.0-99.9% removal efficiency before releasing its exhaust to the air. Dow Reichhold on-site releases are 65% of 1998 levels. Half of their 2002 on-site releases were attributable to 1,3,-butadiene.

**Rank #15 - Justin Tanks** – Justin tanks, located in Georgetown, manufactures a wide variety of Fiberglass Reinforced Plastic (FRP) tanks for use in the chemical, agricultural, and food industries.




Justin reported on one TRI chemical, styrene, for 2002. Styrene is used as a monomer in the polymerization of fiberglass resin. The majority of the styrene remains in the resin during the polymerization process, and the curing process releases a small amount to the air after the tanks have been produced.

**Combined Top 15 Facilities Trend –** Figure 9 shows the totals for on-site releases for the top 15 facilities. These facilities represent over 97% of the total on-site releases for 2002. The total on-site release trend for these facilities is down 28% since 1998. No adjustments were made to exclude newly reportable chemicals in this time. Additional trends will be presented later in this report, and some of these trends take into account the new reporting requirements.



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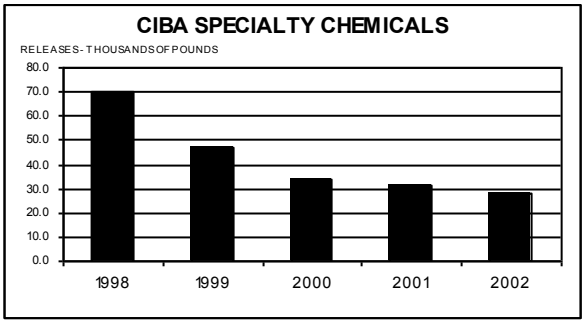
## Second 15 Facilities

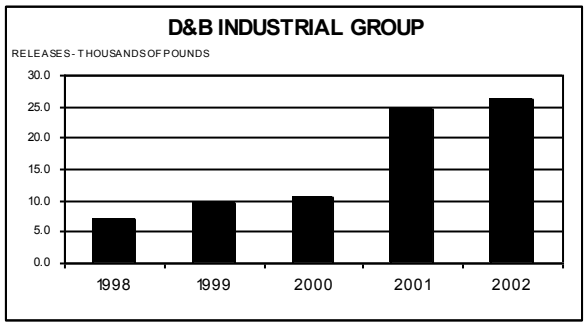
As with the first 15 facilities, a brief description of the second 15 facilities is presented on the next several pages. Although the second 15 group of facilities release a much smaller amount of TRI chemicals on-site, their operations are an important part of Delaware's economy. Again, the ranking is based on the total facility reported on-site releases.

**Rank #16 – Ciba Specialty Chemicals** - Ciba Specialty Chemicals is located in Newport. Ciba manufactures pigments for the paints, plastic, and printing industries. They reported on seven TRI chemicals for 2002. All on-site releases were to air.




The predominant chemical released to air was methanol. Methanol is used as a solvent in the pigment manufacturing process. A significant portion of methanol used at the facility is recycled. Ciba has expanded and modernized their operation since 1998. Although they doubled capacity, they achieved a 60% reduction in on-site releases since 1998. They also reduced transfers off-site to water treatment by 76%.

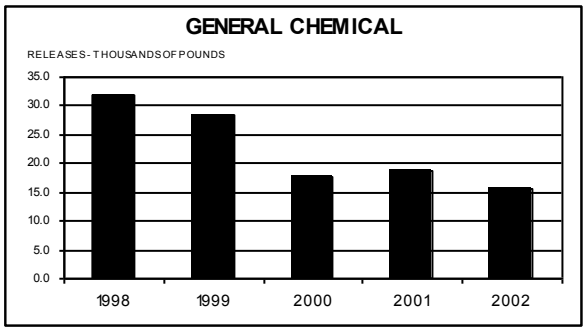
**Rank #17 – D&B Industrial Group –** D&B is Located in Georgetown adjacent to the airport.




D&B manufactures electrical insulating sleeves and bushings for industrial and appliance applications.

D&B reported one TRI chemical, methyl ethyl ketone. It is used as a solvent in their process. Because of a change in the way MEK releases were calculated, reported on-site releases of MEK have increased by over a factor of 3 since 1998.

**Rank #18 – General Chemical –** General Chemical is located in Claymont near the Pennsylvania state line.

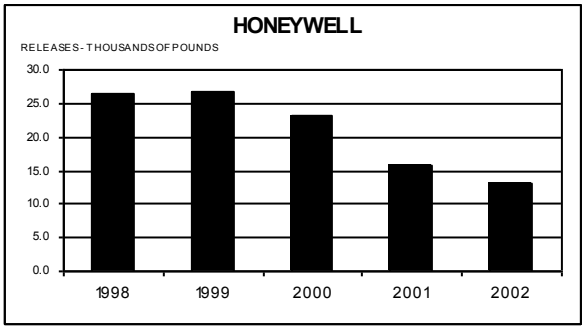



General Chemical recycled spent sulfuric acid and acid gas in 2002 and earlier. This acid and acid gas came from petroleum refineries that used virgin sulfuric acid as a catalyst in their manufacturing process and needed to regenerate the spent sulfuric acid. The facility produced regenerated sulfuric acid, sulfur, and other sulfur based products.

On-site releases have decreased about 50% over the past 5 years. This decrease reflects reductions in operations during 2002 and installation of new process equipment that resulted in increased manufacturing efficiencies and reduced releases. This facility closed its South Plant sulfuric acid regeneration operation in 2003, but its North plant fluosulfonic acid and related products plant remains in operation.

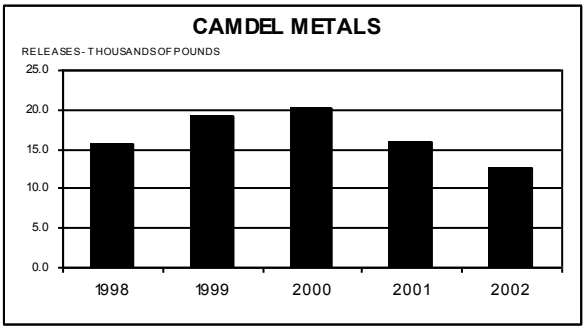
**Rank # 19 – Perdue Agrirecycle -** Perdue Agrirecycle is located near Seaford and manufactures fertilizer products from waste received from its poultry growing operations. Reporting year 2002 was the first year for this facility to report, and they reported 14,000 pounds of ammonia released to on-site air. No trend graph for this facility will be available until enough years are reported to establish a meaningful trend.

**Rank #20 – Honeywell International -** Honeywell, located in Claymont adjacent to General Chemical and Sunoco, manufactures specialty chemicals that are used in agricultural, pharmaceutical, and household products. This facility also produces boron trifluoride, used in the production of hydrocarbon resins, lubricants, and adhesives.




The Honeywell facility reported on six TRI chemicals in 2002. Releases of ammonia and n-hexane, used in production of caulking, accounted for about 95% of their total on-site releases. Honeywell has reduced their on-site releases by 50% since 1998.

**Rank #21 - Camdel Metals -** Camdel Metals manufactures seamless and welded specialty stainless steel tubing. The tubing is used in medical, oil drilling, semiconductor, chemical, and instrumentation applications. The tubing ranges in size from 1/8 to 3/4 inch diameter. Some types may be supplied in coils as long as 25,000 feet.




Trichloroethylene is used as a solvent to clean the tubing. Camdel Metals reports on-site releases of this chemical each year. These on-site releases have decreased by 20% since 1998.

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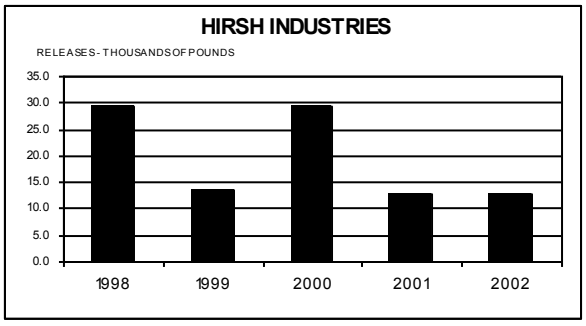
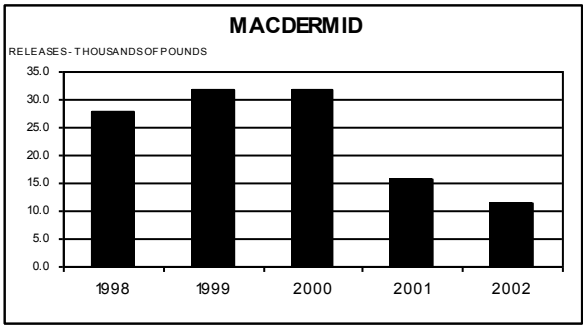
**Rank #22 – Hirsh Industries –** Hirsh Industries produces a line of consumer durables. These products include file cabinets, shelving units, and lateral filing systems. These items are used in home and office applications. Hirsh Industries is located on the north side of Dover.




Hirsh reported one TRI chemical, certain glycol ethers. It is used as a paint solvent in their process. On-site releases of certain glycol ethers have decreased by over 50% since 1998. This trend is the result of a more effective painting process, improved paint products from their vendors, and improvements in estimating the amounts of release. The amount also varies year-to-year because of the amount used in the process.

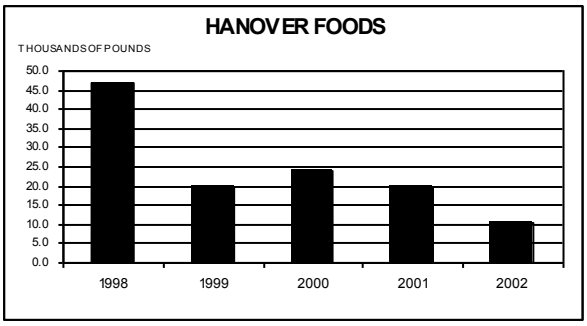
**Rank # 23 - MACDERMID, INC. -** MacDermid, Inc. is a specialty chemical manufacturer. It serves industries that include industrial finishing, electronics, and graphic arts/printing. MacDermid is also a supplier of consumable products and services for the printing, packing, and converting industries worldwide.




Located in Middletown, the MacDermid facility manufactures photopolymer resins, photo-polymer film and liquid resist compounds. These products are used in the graphic arts, electronics and semi-conductor industries respectively.

MacDermid reported on-site releases of Methyl Ethyl Ketone and Toluene Diisocyanate in 2002. Their releases since 1998 have decreased 59%.

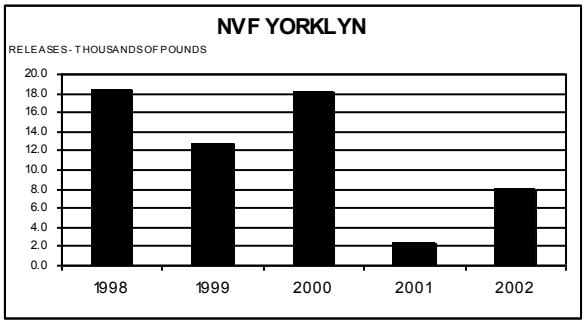
**Rank #24 - Hanover Foods -** Hanover Foods produces a variety of fresh, frozen, refrigerated, and canned vegetables, entrees, and snack foods. Customers for these products are the retail, foodservice, private label, military, club store, and industrial markets.




Located in Clayton, the facility freezes fresh vegetables including corn, peas, lima beans, spinach, carrots, and mushrooms, and packages frozen entrees. Hanover reported ammonia releases for the past several years. This was primarily due to leaks and other losses in their refrigeration equipment. Their on-site releases have decreased by 78% since 1998.

**Rank #25 – NVF Yorklyn –** NVF Yorklyn produces high density, 100% cellulose, vulcanized fiber products. This product is used for punched and molded electrical insulation products, tubular fuses, furniture laminates, and abrasive sanding discs. NVF is located in Yorklyn, in northern Delaware near the Pennsylvania state line.

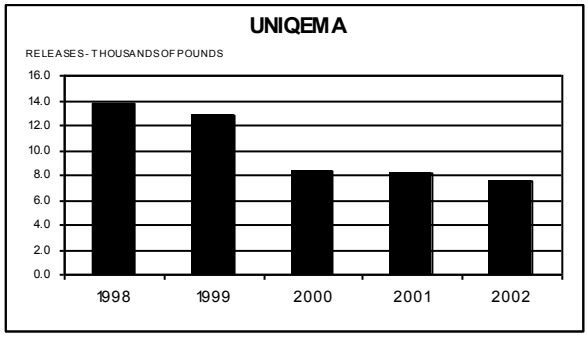
NVF reported one TRI chemical, zinc compounds. The vulcanizing process involves the simultaneous immersion of multiple rolls of cellulose-based paper into a zinc chloride acid bath that gelatinizes them into a single, high density material. The zinc chloride is then leached out and reclaimed internally for reuse. Onsite releases are down 50% from the 1998-2000 period reflecting reductions in operations and improvements in the reclamation process.




**Rank # 26 – UNIQEMA -** Formerly ICI Atlas Point, these companies have occupied this site located in New Castle near the Delaware Memorial Bridge since 1971.

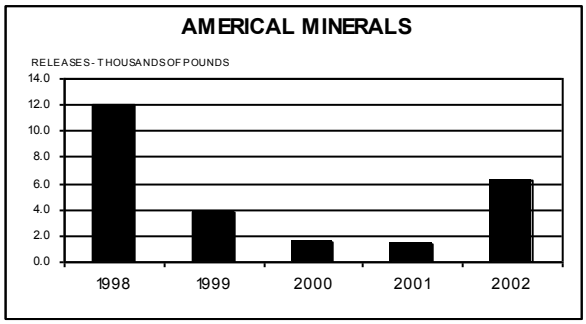
This facility manufactures products that promote the mixing of oil and water based ingredients in many consumer products, such as baby shampoo, shaving cream, mouthwash, pharmaceuticals, and many other personal care and industrial products.

Uniqema reported on seven chemicals for 2002. The majority of chemical release was ethylene oxide and propylene oxide. All on-site releases were to air. Uniqema TRI releases have decreased 45% since 1998.



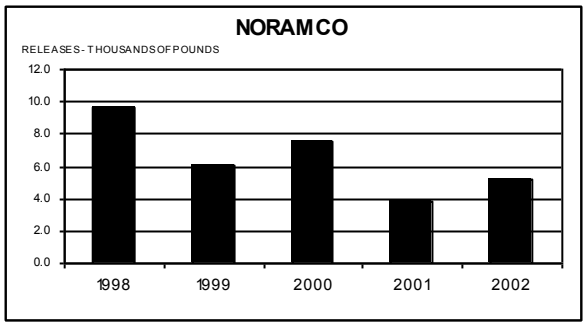

**Rank #27 - American Minerals** - American Minerals Inc. is a custom processor of natural occurring ores and minerals. These minerals include manganese, olivine, iron chromite, and magnesite.

American Minerals is located in New Castle. This facility converts ore materials into products which are which are utilized by industry and the public on a daily basis such as bricks, steel, and fertilizer. American Minerals grinds, crushes, screens, and blends these materials into products tailored to the specific needs of their industrial, agricultural, and environmental remediation customers.



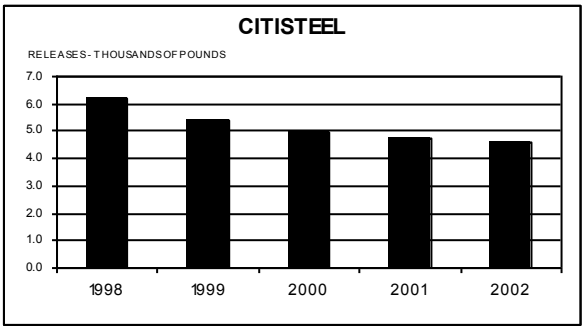
American Minerals reported on 5 TRI chemicals for 2002. These were all metals or metal compounds. The greatest release was to air for manganese compounds. Although this facility has reduced its on-site releases by 48% since 1998, they did have an increase over 2001 because manganese inventory was increased and the manganese emission factor used to estimate releases was increased.

**Rank #28 – Noramco -** Located in Wilmington, Noramco was formed in 1979. Noramco products include bulk active pharmaceutical ingredients and medical devices. The pharmaceutical products are primarily sold to Johnson & Johnson pharmaceutical sector finishing facilities in the United States, Argentina, Belgium, Brazil, Ireland, and Mexico. The medical devices are incorporated in medical products used by other Johnson & Johnson companies.




Noramco reported on-site releases of five TRI chemicals in 2002. The largest on-site chemical release was dichloromethane. All on-site releases were to air. Noramco on-site releases have decreased by 46% since 1998, with year-to-year variations reflecting both the level of production and efforts to reduce releases.

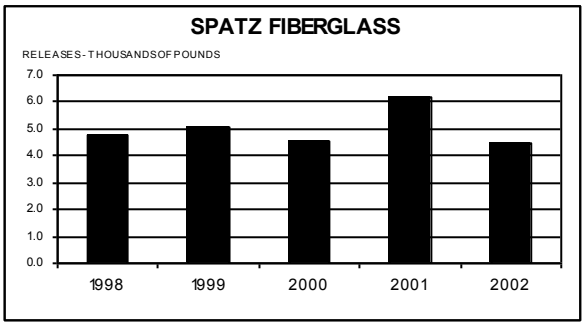
**Rank #29 - CitiSteel** - Located on a 425 acre site in Claymont, CitiSteel manufactures carbon steel plate for heavy industrial applications. The facility purchases and recycles over 300,000 tons of scrap steel annually and melts it in an electric arc furnace. The melted steel is cast into large slabs which are rolled into plates of thicknesses from 3/8" to 4" or more. The plates are sold throughout the Northeast, Mid-Atlantic, Southeast, and Midwestern regions of the United States.



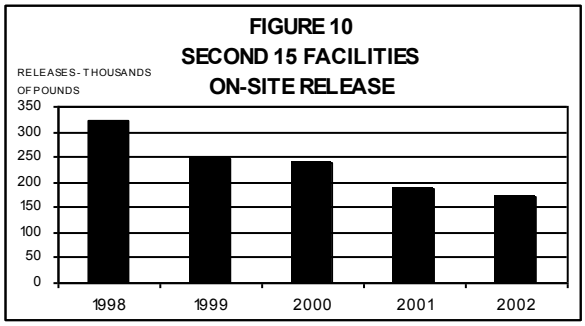

CitiSteel reported on-site releases of 7 TRI chemicals, all metallic compounds, in 2002. Most of the releases were to air. The largest reported release to air was zinc compounds. Citisteel reported a decrease of 26% in on-site releases since 1998.

**Rank #30 – Spatz Fiberglass** – Spatz Fiberglass Inc. is a custom manufacturer of fiberglass-reinforced products. Spatz manufactures Industrial duct and fume hood fiberglass components. They also manufacture seats and tables for restaurants, and architectural columns and landscaping products. Typical customers include industrial facilities, restaurants, and schools.

Spatz reported one TRI chemical, styrene, in 2002. It is used as a solvent in their process. On-site releases of styrene have decreased by 7% since 1998, with some variation year-to-year. The amount varies because of the amount of product produced by the facility.




**Combined Second 15 Facilities Trend -** Figure 10 shows the totals for the facilities ranked #16-30 for on-site releases. The trend is down by 44% since 1998. This trend shows a greater percent decrease than the top 15 group, which had a 28% decrease. Because of the larger percent reduction of the Second 15, its contribution to the state total decreased from 3% in 1998 to 2% in 2002. Again, as with the top 15 facilities, a facility would have to effect annual reductions in its on-site releases in order to maintain its rank. In the Second 15, this annual reduction would be about 11%. A facility may, in fact, show a decrease, yet have an increase in rank. For example, two facilities in this group each showed a total decrease of greater than 19% since 1998, yet each climbed 7 places in rank since 1998 because the group had an average decrease of 44%. In addition, facilities in this group tend to be more closely spaced in their rankings with regard to pounds released on-site. This adds to the variability in rankings from year-to-year as individual facility releases vary in their normal course of operations.



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# Common Toxic Chemicals and their Hazards

Presented here in descending order of the amount released on-site to air, water, and/or land (see Figures 5-7 on pages 11-13) are the top 15 TRI chemicals. This information is presented as a quick reference summary of information for these toxic chemicals. This is not a detailed source of information on the sources, uses, or hazards of these chemicals. This information was obtained from the *DNREC Chemical Data Fact Sheets* and the *Hazardous Substance Fact Sheets* provided by the New Jersey Department of Health and distributed by the EPA. The source for this information is listed in the *For Further Information* section in pages 46-47 of this report. The reader may also consult other chemical or toxicology reference materials to learn more about chemicals of interest. Excerpts for Nitrate Compounds came from EPA *The National Nitrate Compliance Initiative*, April 2002. Excerpts for metallic compounds came from EPA *Risk Burn Guidance for Hazardous Waste Combustion Facilities*.

**AIR - From Figure 5 on page 11**

**Hydrochloric Acid**
(Aerosol portion only is reportable)
Used in: Metal processing and cleaning, analytical chemistry, and making other chemicals.
Hazard: Corrosive. Can cause skin and eye burns, irritation of mouth, nose and throat.

**Sulfuric Acid**
(Aerosol portion only is reportable)
Used in: Fertilizers, chemicals, dyes, petroleum refining, etching, analytical chemistry, metal manufacturing, and explosives.
Hazard: Corrosive. Can cause skin and eye burns, irritation of mouth, nose and throat.

**Certain Glycol Ethers**
Used in: Solvents.
Hazard: Can irritate the eyes, nose, and throat and skin, toxic by inhalation and ingestion or skin absorption.

**Hydrogen Fluoride**
Used in: Etching glass, manufacturing chemicals and gasoline.
Hazard: Corrosive. Can cause severe irritation to the eyes, nose, and throat and skin, toxic by inhalation and ingestion or skin absorption.

**Xylene – Mixed Isomers**
Used in: Solvents and in making drugs, dyes, insecticides, and gasoline.
Hazard: Can irritate the eyes, nose, and throat. Toxic by inhalation and ingestion. May cause memory and concentration problems. Repeated exposure may cause low blood cell count.

**Carbonyl Sulfide**
Used in: Chemical manufacturing
Hazard: Can irritate the eyes, nose, and throat and skin, toxic by inhalation and ingestion or skin absorption. High exposure may cause nausea dizziness, confusion, vomiting, increased or irregular heartbeat.

**Vinyl Chloride**
Used in: Plastics and chemical manufacturing
Hazard: Carcinogen, mutagen. Toxic by inhalation and ingestion or skin absorption. May cause damage to developing fetus. May damage liver, kidneys, bones, blood vessels, and skin. Exposure may cause you to feel drowsy or lightheaded.

**Vinyl Acetate**
Used in Plastics and chemical manufacturing
Hazard: Can irritate the eyes, skin, nose, and throat. High levels of exposure can cause dizziness. Can damage the lungs. Is a hazardous substance, is flammable and reactive. Is soluble in water and toxic to wildlife.

**Ammonia**
Used in: Refrigerant, in manufacturing fertilizer, plastics, dyes, and textiles. A product of natural organic decomposition, run-off from fields and feedlots, waste treatment plant and refinery/chemical manufacturing effluents.
Hazard: May irritate lungs, eyes, nose, throat, and mouth. Corrosive, can severely damage eyes and cause permanent damage, Contact with liquid can freeze skin.

**N-Butyl Alcohol**
Used in: Solvent for fats, resins, waxes, gums, shellac and varnish. Also used in manufacture of chemicals and oils.
Hazard: Toxic by inhalation and ingestion or skin absorption. May irritate and damage skin and eyes on contact. Breathing high concentrations can cause coughing, wheezing and shortness of breath, can cause headache, nausea, vomiting and dizziness, and may lead to an irregular heartbeat. Exposure can damage the liver, heart, kidneys, hearing and the sense of balance.

**Methanol**
Used in: Solvents, cleaners.
Hazard: Toxic when inhaled, ingested, or by skin contact. Exposure may cause blindness, nausea, headaches, vomiting, and dizziness. Flammable and a fire hazard.

**1,2,4,-Trimethylbenzene**
Used in: Manufacture of dyes, pharmaceuticals.
Hazard: Toxic when inhaled and by skin contact. Can irritate the nose, throat and eyes. Contact can irritate the skin. Prolonged contact may cause skin burns. Repeated exposure may damage the liver and kidneys.

**N-Hexane**
Used in: Chief constituent of petroleum ether, gasoline, and rubber solvents. Also used in solvents for adhesives, in organic analysis, and in denaturing alcohols.
Hazard: Toxic when inhaled, ingested, or by skin contact. Exposure can cause lightheadedness, giddiness, headaches and nausea. Flammable liquid and a fire hazard.

**N-Methyl-2-Pyrrolidone**
Used for: Process solvent, paint stripper, industrial cleaners.
Hazard: Toxic when inhaled and by skin contact. Can irritate the skin, nose, throat and eyes.

**Ethylene**
Used in: Manufacture of ethylene oxide and other organics such as plastics resins, fibers, solvents coatings, and antifreeze.
Hazard: Flammable and reactive. Normally a gas, but also soluble in water. Exposure to high concentrations can irritate the skin eyes, nose and throat and can cause dizziness.

**WATER – From Figure 6 on page 13 - Chemicals not reported in the Air section above**

**Nitrate & Nitrite Compounds (Sodium Nitrate, Sodium Nitrite)**
Nitrates are toxic chemicals that can pose serious risks to human health and the environment. High levels of nitrates may cause significant environmental damage to streams, lakes, and rivers. Elevated levels of nitrates may damage surface water and ground water with excess nutrients and can cause algae blooms in coastal waters, which can remove oxygen from the water and result in fish kills. High levels can displace oxygen from the bloodstream and produce blue color in the skin and lips. The National Academy of Sciences recently reported that pollution by nitrogen and phosphorous were causing damage in most of the nation's coastal inlets, and severe problems were identified in 44 of the 139 coastal areas examined.

**Cresol**
Used in: Making synthetic resins, photographic developers, explosives. Used in disinfectants and fumigants. .
Hazard: Toxic by inhalation or skin exposure. Corrosive, will cause skin and eye burns, possibly blindness. Soluble in water, toxic fish life. Is on hazardous substances list.

**Phenol**
Used in: Making in making plywood, pharmaceuticals, plastics, and rubber. Common product of refinery wastes
Hazard: Toxic by inhalation or skin exposure. Mutagen, can cause genetic changes, will cause skin and eye burns, possibly permanent eye damage. Soluble in water, toxic to fish life. Is on hazardous substances list.

**Manganese Compounds ***
Used in: Dry-cell batteries, matches, fireworks, and the production of other manganese compounds, in animal feed, fertilizer, livestock nutritional supplement, in glazes and varnishes, and in ceramics, for water purification purposes in water and waste-treatment plants.
Hazard: Toxic when Inhaled.

**Vanadium Compounds ***
Used in: Steel alloys, other Vanadium compounds, x-ray equipment, sulfuric acid, and synthetic rubber.
Hazard: Toxic when inhaled. Can irritate skin, nose, throat and lungs.

* These metallic compounds are usually by-products produced from impurities in the fuel associated with coal or oil combustion and/or ore processing.

**Copper and Copper Compounds ***
Used in: Electrical wiring, plumbing, fungicides, pesticides, electroplating, paint pigments and catalysts.
Hazard: Toxic when inhaled. Can irritate the eyes, nose and throat. May cause a skin allergy. Repeated high exposure to copper can affect the liver.

**Zinc and Zinc Compounds ***
Used in: Rustproof coating on iron and steel, making brass alloys, car parts, electroplating, batteries, electrical products, paints, and fungicides.
Hazard: Zinc Oxide Fumes (released during welding on galvanized metal) are toxic when inhaled. Zinc dust is a skin irritant.

**Benzene**
Used in: Used to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.
Hazard: Benzene is a carcinogen. Toxic when inhaled or ingested. Exposure to high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness.

**Toluene**
Used in: Solvent for perfumes, medicines, dyes, explosives, detergents gasoline and chemicals.
Hazard: Toxic when inhaled, ingested, and by skin contact. It may damage the developing fetus. Contact can irritate the skin and eyes. Breathing toluene can irritate the nose and throat causing coughing and wheezing. Exposure can affect the nervous system causing trouble concentrating, headaches and slowed reflexes. Repeated Toluene exposure may cause liver, kidney and brain damage. Highly flammable and explosive.

**Nickel and Nickel Compounds ***
Used in: Alloys and electroplating, catalysts, dyes, and textile printing.
Hazard: Carcinogenic. Toxic by inhalation. Eye and skin irritant. Repeated exposure may cause scarring of the lungs and may affect the kidneys.

**Molybdenum Trioxide ***
Used in: Agriculture, making other Molybdenum compounds, ceramic glazes, enamels, pigments, and in analytical chemistry.
Hazard: Toxic when inhaled, may irritate the nose throat and bronchial tubes. Repeated overexposure may cause weight loss, diarrhea, poor muscle coordination, headaches, and muscle or joint pain.

**Barium and Barium Compounds ***
Used in: Spark plugs and engine rod bearings, and to remove gas from vacuum tubes and television picture tubes.
Hazard: Toxic when inhaled, may irritate skin, eyes, nose and throat.

* These metallic compounds are usually by-products produced from impurities in the fuel associated with coal or oil combustion and/or ore processing.

**Ethlybenzene**
Used in: Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.
Hazard: Toxic by inhalation, will irritate eyes, nose throat, and skin. Exposure may cause dizziness, lightheadedness, and breathing difficulty.

**LAND – From Figure 7 on page 13 - Chemicals not reported in the Air and/or Water sections above**

**Chromium Compounds ***
Used in: Stainless and alloy steels, refractory products, tanning agents for leather, pigments, electroplating, catalysts, and corrosion-resistant products.
Hazard: Irritant and corrosive to human tissue, chromium compounds are carcinogens. Hexavalent compounds are more toxic than trivalent compounds.

**Manganese***
Used in: Steelmaking, dry cell batteries, potassium permanganate.
Hazard: Is a hazardous substance. Toxic by inhalation. Repeated exposure can cause brain damage, may damage kidneys and liver.

**Lead and Lead Compounds ***
Used in: Storage batteries, ammunition, cable covering, ceramic glazes, casting metals and solders.
Hazard: Toxic by ingestion. Can cause brain damage, particularly in children, suspected carcinogen.

**Cobalt Compounds ***
Used in: Cobalt is used in steel alloys and jet engines, in nuclear technology, and in cemented carbide abrasives and tools. It is a component in vitamin B12
Hazard: Possible carcinogen. Toxic by inhalation, is a skin irritant. Exposure can irritate the lungs and skin. Repeated exposure to the metal dust can cause scarring of the lungs. Normally appears as dust or solid form.

**Mercury and Mercury Compounds**
Used in: Thermometers, barometers, vapor lamps, mirror coatings, and in making chemicals and electrical equipment.
Hazard: The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

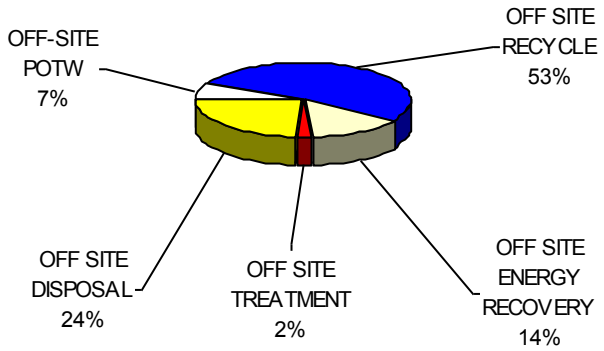
* These metallic compounds are usually by-products produced from impurities in the fuel associated with coal or oil combustion and/or ore processing.

# Off-Site Transfers

Off-site transfers are material transfers to off site locations for the purpose of disposal, recycling, energy recovery, treatment, or to publicly owned treatment works (POTW's), typically, municipal wastewater treatment plants.

Figure 11 shows the relative portions transferred to the five off-site transfer categories, and Table 4 on page 7 shows these values in tabular form. Appendices D and G provide additional detail. TRI Chemicals in wastes are transported by various means through Delaware to their final destinations, many of which are out of state. TRI chemicals were sent to 21 states, some as far away as Arizona, Texas and Utah. About 93% of TRI chemicals in all wastes and over 99% of non-POTW wastes were sent to out of state locations for further processing and/or disposal.

**FIGURE 11**
**2002 OFF SITE TRANSFERS**



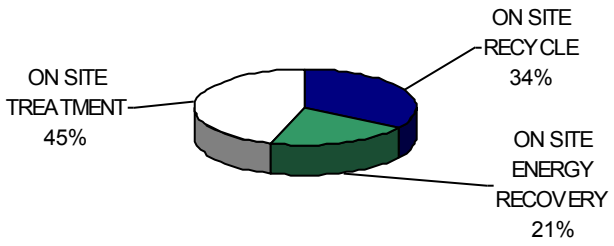

TOTAL: 17,583,245 POUNDS

Off-site transfer to recycle operations accounted for more than half of the amounts in these five categories, and disposals accounted for almost another quarter of the transfers. Over 90 percent of the transfers to POTW's were to the City of Wilmington POTW. Note that the pounds recycled off-site (Table 4 on page 7) is greater than all on-site releases, and the total amount transferred off-site is over 2 times the amount of on-site releases. Off-site transfers account for 18 percent of the total TRI wastes.

# On-Site waste Management

On-Site Waste Management is the amount of wastes that never leave the facility site and are managed by the facility on-site. The total amount of TRI chemicals managed on-site is 74 percent of the total TRI chemical waste. The categories of **Recycle, Energy recovery, and Treatment** are used to define the on-site management of TRI chemical wastes. Figure 12 shows the portions of these wastes processed on-site. Appendices D and G provide additional detail about waste management of these chemicals. **Recycled waste** is the quantity of the toxic material recovered at the facility and made available for further use. **Energy Recovery** includes the quantity of toxic material that had heat value and was combusted in some form of energy recovery device such as a furnace. The **Waste Treatment** segment includes the amount of toxic material that was destroyed in on-site waste treatment operations.

**FIGURE 12**
**2002 ON SITE WASTE MANAGEMENT**




TOTAL: 74,151,170 POUNDS

# Total Waste

Total waste is the combined total of the on-site release, off-site transfer, and on-site waste management portions of the TRI chemical report. Figure 13 provides a perspective of the total TRI chemical waste picture in Delaware. About three quarters of the total TRI chemical wastes in Delaware are managed on-site through treatment, energy recovery, and recycle operations by the facility generating the waste.

**FIGURE 13**
**TOTAL 2002 TRI CHEMICAL MANAGEMENT**
**TOTAL: 99,773,463 POUNDS**

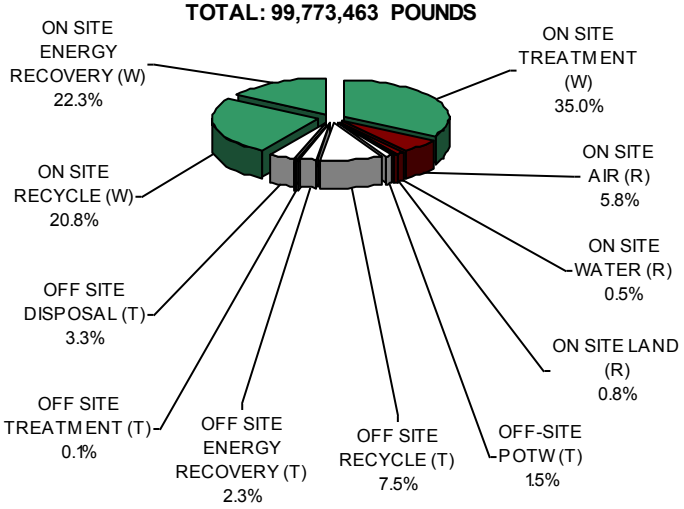



**Figure 13 key**
(R) – On-Site Release
(T) – Off-Site Transfer
(W) – On-Site Waste Management

# Receiving TRI Chemicals in Wastes

When a facility transfers TRI chemical waste off-site, these wastes go to a receiving facility. Some of the receiving facilities report to the TRI program as well, but many do not, based on the reporting requirements shown on pages 1 and 2. Less than four percent of the TRI chemical wastes transferred to Delaware facilities is transferred to a TRI reporting facility. Table 9 provides the total amounts of TRI chemicals received by Delaware facilities from in-state and out-of-state facilities. This data is separated into wastes transferred from other Delaware facilities and wastes transferred from out-of-state facilities. DNREC does not receive reports from any out-of-state facilities that transfer wastes into Delaware. This data was obtained from the U. S. EPA. Some changes may have occurred since the date of this data.

**TABLE 9**
**SUMMARY OF TRANSFERS IN 2002**
**TRI CHEMICALS TRANSFERRED TO DELAWARE FACILITIES**
**FROM OTHER FACILITIES**

(in pounds)

| *DE RECEIVING FACILITY* | *TOTAL TRANSFERS FROM DELAWARE FACILITIES (DE DATA) (1)* | *TOTAL TRANSFERS TO DE FROM OUT OF STATE (EPA DATA) (2)* | *TOTAL TRANSFERS RECEIVED BY DELAWARE FACILITIES* |
|---|---|---|---|
| ASHWORKS DELAWARE | 0 | 252 | 252 |
| BRANDYWINE RECOVERY | 0 | 1,877,631 | 1,877,631 |
| CLEAN EARTH | 0 | 1,419 | 1,419 |
| CANNON SCRAP METAL | 11,038 | 0 | 11,038 |
| D & D DISMANTLING | 36,006 | 0 | 36,006 |
| D & S WAREHOUSE | 53 | 0 | 53 |
| DE RECLYCABLE PRODUCTS | 293 | 0 | 293 |
| DSWA CHERRY ISLAND | 302 | 0 | 302 |
| DSWA LAMBSON LANE | 10,135 | 0 | 10,135 |
| DSWA SANDTOWN | 160 | 0 | 160 |
| DUPONT EXPERIMENTAL STATION | 17 | 1,302,672 | 1,302,689 |
| FIRST STATE RECYCLING | 0 | 133 | 133 |
| GENERAL CHEMICAL * | 2,905 | 145,299 | 148,204 |
| GEORGE & LYNCH | 238 | 0 | 238 |
| INDUSTRIAL RESOURCE NETWORK | 0 | 1,551 | 1,551 |
| INTERNATIONAL PETROLEUM CORP. | 0 | 11,009 | 11,009 |
| KENT COUNTY TREATMENT PLANT | 1,492 | 0 | 1,492 |
| MILLSBORO TREATMENT PLANT | 0.18 | 0 | 0.18 |
| MOT TREATMENT PLANT | 275 | 0 | 275 |
| NEW CASTLE DEPT. OF PUBLIC WORKS | 30,671 | 0 | 30,671 |
| SEAFORD MUNICIPAL TREATMENT PLANT | 4,732 | 0 | 4,732 |
| TILCON DELAWARE INC. | 78 | 0 | 78 |
| UNIQEMA * | 21,074 | 0 | 21,074 |
| VFL TECHNOLOGY CORPORATION | 665 | 18,423 | 19,087 |
| WILMINGTON WASTEWATER PLANT | 1,163,880 | 5,377 | 1,169,257 |
| **TOTAL TRANSFERS RECEIVED** | **1,284,013** | **3,363,765** | **4,647,778** |

(1) Source: DNREC TRI Database 2002 Data, February 2004

(2) Source: U.S.EPA 2002 TRI Data Run, December, 2003

* TRI Reporting Facility

The top receiving facility is Brandywine Recovery, receiving toluene for recycling from one out-of-state TRI facility. The DuPont Experimental Station received the second largest amount of off-site TRI chemicals, primarily from other out-of-state DuPont facilities. Some of these chemicals are TRI chemicals, 99.9% of which were incinerated. The third largest receiver of TRI chemicals in wastes was the Wilmington Wastewater Plant; receiving wastewater from industrial and municipal customers in the region. Some of this wastewater contains TRI chemicals. These three receiving facilities account for 94% of all TRI chemicals received from other TRI facilities.

TOXICS RELEASE INVENTORY

# Persistent Bioaccumulative Toxic (PBT) Chemicals

Persistent Bioaccumulative Toxics (PBT's) are receiving increased scrutiny as we learn more about them, and reporting PBT's is also being emphasized to an increasing degree. These chemicals are of particular concern because they are not only toxic, but because they remain in the environment for long periods of time, are not readily destroyed, and build up and accumulate in body tissues. The EPA established substantially lower reporting thresholds in 2000 for 15 chemicals and three categories that are highly persistent and bioaccumulative in the environment. Starting in 2001, lead and lead compounds (except lead contained in stainless steel, brass, or bronze alloys) have reduced thresholds of 100 pounds. Table 2 on page 3 shows the lower thresholds for all PBT's. Therefore, not all of the PBT chemicals released in prior years were reportable, even though they were likely released at or near the current reported rate. For example, twenty one facilities reported lead or lead compounds in 2002 and 2001 compared to seven in 2000. All of these facilities were in operation prior to 2001.

## TABLE 10
## 2002 TRI PBT DATA SUMMARY
**(IN POUNDS)**

| | All Data 2002 | PBT's only 2002 | PBT's only 2001 |
|---|---|---|---|
| No. of facilities | 84 | 32 | 23 |
| No. of Form A's | 55 | 0 | 0 |
| No. of Form R's | 317 | 66 | 51 |
| No. of Chemicals | 106 | 11 | 12 |
| On-site Releases | | | |
| Air | 6,295,850 | 5,282 | 5,681 |
| Water | 928,813 | 784 | 3,659 |
| Land | 814,385 | 17,166 | 21,852 |
| Total Releases | 8,039,048 | 23,232 | 31,192 |
| Off-site Transfers | | | |
| POTW's | 1,201,161 | 818 | 521 |
| Recycle | 9,248,730 | 5,053,729 | 4,570,954 |
| Energy Recovery | 2,538,090 | 0 | 0 |
| Treatment | 398,572 | 1 | 0 |
| Disposal | 4,196,691 | 69,178 | 61,680 |
| Total Transfers | 17,583,245 | 5,123,727 | 4,633,155 |
| On-site Waste Mgmt. | | | |
| Recycle | 25,033,817 | 3,960 | 4,075 |
| Energy Recovery | 15,740,469 | 0 | 210 |
| Treatment | 33,376,885 | 390 | 400 |
| Total on-site Mgmt. | 74,151,170 | 4,350 | 4,685 |
| Total Waste | 99,773,463 | 5,151,309 | 4,669,032 |

Table 10 shows the results of PBT reporting for 2001 and 2002, compared to total 2002 TRI data. PBT on-site releases for 2002 comprise about 0.3% of the total TRI on-site releases. PBT on-site releases were lower by 26% for 2002 but off-site transfers and on-site waste management amounts increased, increasing the total PBT waste by 10%. Not enough years have passed to provide a meaningful trend since the lead threshold change in 2001. Form A may not be used to report PBT"s.

Table 11 on the next page shows the amounts of each PBT chemical reported released by the TRI reporting facilities in 2002. Lead compounds, reported at 21,362 pounds with its lower threshold starting in 2001, made up 87% of the total on-site PBT releases and 95% of the transfers off-site.

Although the Dover Air Force Base Small Arms Range was top reporter for on-site lead release in 2001, it did not report any lead release for 2002. The Indian River Power Plant was the top reporter in 2002 for on-site lead compounds release.

Johnson Controls again reported the top amount of lead transferred off-site, to recycling. Dover Air force Base and Indian River Power Plant reported on lead and lead compounds for the first time in 2001. Johnson controls has been reporting on lead compounds since 1987.

TABLE 11
2002 PBT RELEASE SUMMARY
(IN POUNDS)

| | | ON-SITE RELEASES | | | | | |
|---|---|---|---|---|---|---|---|
| PBT CHEMICAL | REPORTS | TOTAL AIR | TOTAL WATER | TOTAL LAND | TOTAL | TRANSFERS OFF SITE | ON-SITE ON SITE WASTE |
| BENZO(G,H,I)PERYLENE | 11 | 0.96 | 2.5 | 0.0 | 3.5 | 0.0 | 250.0 |
| DIOXIN AND DIOXIN-LIKE COMPOUNDS (1) | 7 | 0.0077 | 0.0300 | 0.0021 | 0.0398 | 153.0300 | 0.0000 |
| HEXACHLOROBENZENE | 1 | 0.0 | 52.9 | 0.0 | 52.9 | 2,746.9 | 0.0 |
| LEAD | 7 | 4.3 | 0.7 | 0.0 | 5.0 | 212,159.3 | 0.0 |
| LEAD COMPOUNDS | 14 | 3,701.2 | 689.0 | 16,972.0 | 21,362.2 | 4,877,872.1 | 270.0 |
| MERCURY | 2 | 1,073.9 | 20.8 | 0.0 | 1,094.7 | 29,243.5 | 3,675.0 |
| MERCURY COMPOUNDS | 7 | 449.4 | 0.1 | 194.2 | 643.7 | 112.9 | 0.0 |
| OCTACHLOROSTYRENE | 1 | 0.0 | 0.2 | 0.0 | 0.2 | 469.5 | 0.0 |
| PENTACHLOROBENZENE | 1 | 0.0 | 15.9 | 0.0 | 15.9 | 824.0 | 0.0 |
| POLYCHLORINATED BIPHENYLS (PCB) | 1 | 0.0 | 0.3 | 0.0 | 0.3 | 38.9 | 0.0 |
| POLYCYCLIC AROMATIC COMPOUNDS | 14 | 52.9 | 1.4 | 0.0 | 54.3 | 106.9 | 155.0 |
| **TOTALS** | **66** | **5,282** | **784** | **17,166** | **23,232** | **5,123,727** | **4,350** |

Mercury and mercury compounds remained relatively unchanged this year and remained in third place. Occidental chemical reported again the top amount of on-site PBT chemical waste management with mercury being recycled on-site, and was the sole contributor to the 1,095 pounds of mercury released on-site. Appendix I Shows the PBT data detail, listing all the facilities reporting each PBT chemical.

# NATIONAL PERSPECTIVE

The national 2002 TRI report has not been released by the U.S. Environmental Protection Agency (EPA) as of the writing of this report. However, placing the 2002 Delaware reports alongside the 2001 EPA reports yields some rankings which provide a perspective for Delaware in the national TRI picture. Changes in the 2002 national values may change these rankings.

This data shows that Delaware ranks 45$^{th}$ in the nation in total on-site releases for all TRI chemicals. For on-site releases, 83 facilities in the nation each released more individually than all the facilities in Delaware combined. Delaware provided 0.14% of the total on-site release amounts nationwide.

Some facilities in Delaware do rank at or near the top of the national ranking for specific releases. DuPont Edge Moor ranks #1 in the nation for off-site transfer of dioxin and dioxin-like compounds. Formosa Plastics ranks #2 in the nation for on-site release of vinyl chloride and 8$^{th}$ for on-site release of vinyl acetate. Occidental Chemical ranks 16$^{th}$ in the nation for on-site release of mercury. Motiva ranks 35$^{th}$ for on-site release of methyl tert-butyl ether. Edge Moor/ Hay Road Power Plants rank 91$^{st}$ for on-site release of hydrochloric acid.

TOXICS RELEASE INVENTORY

# TREND ANALYSIS

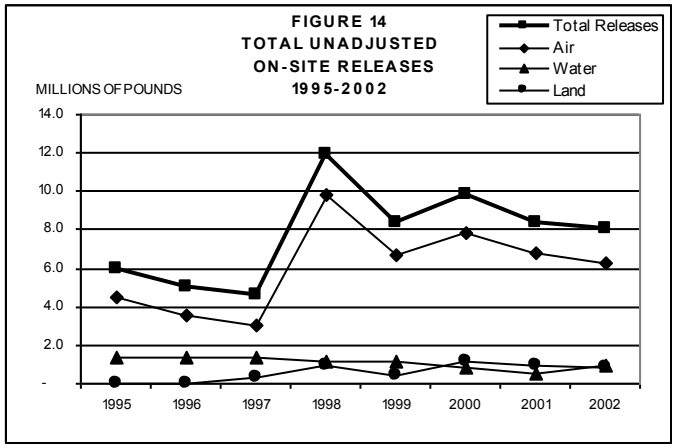
TRI data is available back to 1987. Changes in the reporting requirements over time have caused an increase both in the number of chemicals and in the types of facilities subject to reporting. As explained on pages 2-4, two of the most significant changes to TRI reporting occurred in 1995 and 1998, when large increases in chemicals (1995) and facilities subject to reporting (1998) occurred. The analysis presented in this Trends Analysis section uses 1995 and 1998 as base years for presenting trends for all chemicals (not adjusted) and for only chemicals and facilities subject to reporting over the entire time span (adjusted). Table 12 and Figure 14 show the results of reporting during the 1995-2002 period and are not adjusted for any changes in reporting requirements.

**TABLE 12**
**1995-2002 TRI DATA SUMMARY**
**(IN POUNDS)**
**NOT ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS**

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|
| No. of facilities | 75 | 77 | 74 | 80 | 76 | 80 | 82 | 84 |
| No of Form A's | 33 | 40 | 34 | 75 | 72 | 61 | 57 | 55 |
| No of Form R's | 228 | 220 | 242 | 277 | 254 | 310 | 316 | 317 |
| No. of Chemicals | 90 | 98 | 100 | 106 | 101 | 109 | 104 | 106 |
| On-site Releases | | | | | | | | |
| Air | 4,483,402 | 3,586,182 | 2,995,461 | 9,796,431 | 6,651,166 | 7,841,017 | 6,796,684 | 6,295,850 |
| Water | 1,394,739 | 1,395,328 | 1,328,937 | 1,126,527 | 1,197,861 | 866,312 | 573,937 | 928,813 |
| Land | 28,678 | 42,409 | 317,243 | 937,708 | 462,579 | 1,103,632 | 965,666 | 814,385 |
| Unadjusted On-Site Rele | 5,906,819 | 5,023,919 | 4,641,641 | 11,860,666 | 8,311,606 | 9,810,961 | 8,336,287 | 8,039,048 |
| Off-site Transfers | | | | | | | | |
| POTW's | 3,270,800 | 4,575,131 | 4,354,095 | 3,334,302 | 2,996,401 | 2,199,807 | 1,575,732 | 1,201,161 |
| Recycle | 17,127,835 | 10,054,483 | 10,612,518 | 12,002,926 | 9,295,315 | 8,649,678 | 8,845,326 | 9,248,730 |
| Energy Recovery | 2,427,102 | 1,173,331 | 1,663,440 | 1,491,543 | 1,389,936 | 2,543,840 | 2,642,626 | 2,538,090 |
| Treatment | 910,090 | 1,297,004 | 688,661 | 630,761 | 894,822 | 901,604 | 183,567 | 398,572 |
| Disposal | 2,767,339 | 2,905,928 | 4,010,594 | 3,983,506 | 3,056,466 | 3,816,862 | 3,878,572 | 4,196,691 |
| Total Transfers | 26,503,166 | 20,005,877 | 21,329,308 | 21,443,038 | 17,632,940 | 18,111,791 | 17,125,823 | 17,583,245 |
| On-site Waste Mgmt. | | | | | | | | |
| Recycle | 29,100,208 | 29,882,121 | 32,996,062 | 34,549,050 | 32,671,856 | 31,188,694 | 24,133,870 | 25,033,817 |
| Energy Recovery | 332,834 | 219,184 | 19,255,280 | 16,155,665 | 22,981,591 | 29,095,221 | 25,863,740 | 15,740,469 |
| Treatment | 55,990,904 | 51,590,060 | 69,425,233 | 68,475,327 | 69,501,151 | 64,404,879 | 40,716,252 | 33,376,885 |
| Total on-site Mgmt. | 85,423,946 | 81,691,365 | 121,676,575 | 119,180,042 | 125,154,598 | 124,688,794 | 90,713,862 | 74,151,170 |
| Total Waste | 117,833,931 | 106,721,161 | 147,647,524 | 152,483,746 | 151,099,144 | 152,611,546 | 116,175,972 | 99,773,463 |

NOT ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS

SOURCE: DNREC 2002 DATABASE, FEBRUARY 2004




## On-Site Releases 1995-2002

On-site releases include emissions to the air, discharges to bodies of water, and releases at the facility to land including placement in on-site landfills. Figure 14 shows the trend of on-site releases without adjustments. The increase in 1998 was due to the change in reporting requirements as explained on page 3 with the large increase in the number of facilities required to report. When the new facilities and chemicals that were added starting in 1995 are removed from

the trends, the adjusted result is shown in Table 13 and Figure 15. The amount of on-site chemicals removed by this adjustment increased to 6.2 million pounds in 1998, up from only 21,800 pounds in 1997, and is now at 4.3 million pounds for 2002. Facilities such as the power plants and chemicals such as PBT's at their lower thresholds are not shown in the adjusted trends unless they were already being reported in or prior to 1995. On-site releases have decreased 3.7% since 2001 and 32% since 1998 for all chemicals (Table 12 and Figure 14). On-site releases also decreased 37% since 1995 for "old/adjusted" chemicals – (Table 13 and Figure 15).

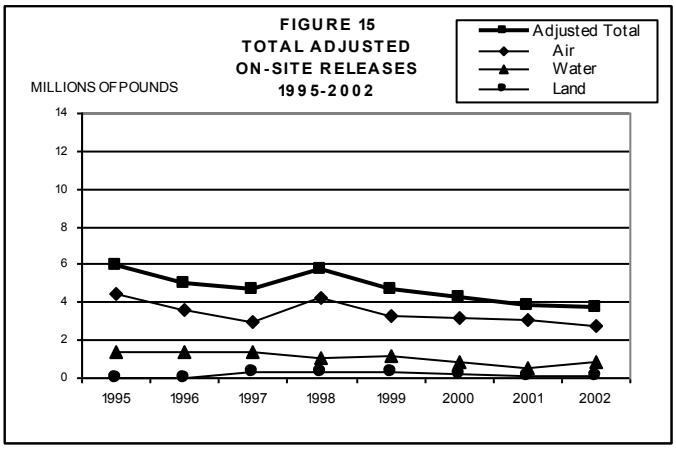
**TABLE 13**
**1995-2002 TRI DATA SUMMARY**
**(IN POUNDS)**
**ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS**

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|
| No. of facilities | 73 | 75 | 73 | 69 | 66 | 67 | 67 | 70 |
| No of Form A's | 28 | 34 | 29 | 30 | 32 | 31 | 31 | 34 |
| No of Form R's | 221 | 212 | 237 | 240 | 231 | 241 | 239 | 55 |
| No. of Chemicals | 87 | 94 | 98 | 103 | 98 | 101 | 95 | 99 |
| On-site Releases | | | | | | | | |
| Air | 4,466,247 | 3,569,898 | 2,973,704 | 4,286,623 | 3,246,226 | 3,179,789 | 3,095,920 | 2,723,022 |
| Water | 1,394,739 | 1,395,328 | 1,328,937 | 1,066,787 | 1,186,039 | 826,597 | 524,292 | 884,109 |
| Land | 28,678 | 42,409 | 317,243 | 347,129 | 278,319 | 194,448 | 145,055 | 117,249 |
| Total Releases | 5,889,664 | 5,007,635 | 4,619,884 | 5,700,539 | 4,710,584 | 4,200,834 | 3,765,266 | 3,724,380 |
| Off-site Transfers | | | | | | | | |
| POTW's | 3,270,795 | 4,564,126 | 4,354,090 | 3,334,189 | 2,996,375 | 2,199,732 | 1,575,639 | 1,200,858 |
| Recycle | 17,127,835 | 10,054,483 | 10,544,518 | 11,963,716 | 9,295,315 | 8,613,087 | 8,840,227 | 9,217,843 |
| Energy Recovery | 2,427,102 | 1,173,331 | 1,663,440 | 1,491,543 | 1,389,936 | 2,543,840 | 2,642,626 | 2,538,090 |
| Treatment | 897,090 | 1,277,004 | 675,561 | 611,696 | 894,822 | 899,534 | 172,939 | 398,571 |
| Disposal | 2,767,339 | 2,905,928 | 4,010,594 | 3,719,902 | 2,985,340 | 3,474,086 | 3,573,860 | 3,828,622 |
| Total Transfers | 26,490,161 | 19,974,872 | 21,248,203 | 21,121,046 | 17,561,788 | 17,730,279 | 16,805,291 | 17,183,984 |
| On-site Waste Mgmt. | | | | | | | | |
| Recycle | 29,100,208 | 29,882,121 | 32,996,062 | 34,549,050 | 32,671,856 | 31,188,654 | 24,133,520 | 25,033,532 |
| Energy Recovery | 332,834 | 219,184 | 19,255,280 | 16,155,665 | 22,981,591 | 29,095,220 | 25,863,740 | 15,740,469 |
| Treatment | 55,811,179 | 51,424,487 | 68,575,887 | 67,199,660 | 69,149,944 | 63,832,520 | 40,103,027 | 32,404,441 |
| Total on-site Mgmt. | 85,244,221 | 81,525,792 | 120,827,229 | 117,904,375 | 124,803,391 | 124,116,394 | 90,100,287 | 73,178,441 |
| Total Waste | 117,624,046 | 106,508,299 | 146,695,316 | 144,725,960 | 147,075,763 | 146,047,507 | 110,670,844 | 94,086,806 |

ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS

SOURCE: DNREC 2001 DATABASE, FEBRUARY 2004

Table 13 shows the adjusted amounts of TRI chemicals in all categories that were reported in 1995-2002. This table is adjusted to show only those facilities and chemicals that were reportable in 1995 and later. The following trends for 1995-2002, in addition to Figure 15, are based on this adjusted data. Overall, adjusted on-site releases decreased 1.1% (41,000 pounds) from 2001, following a 10.4% decrease in 2000-2001. Since 1995, adjusted on-site releases have decreased 37%.

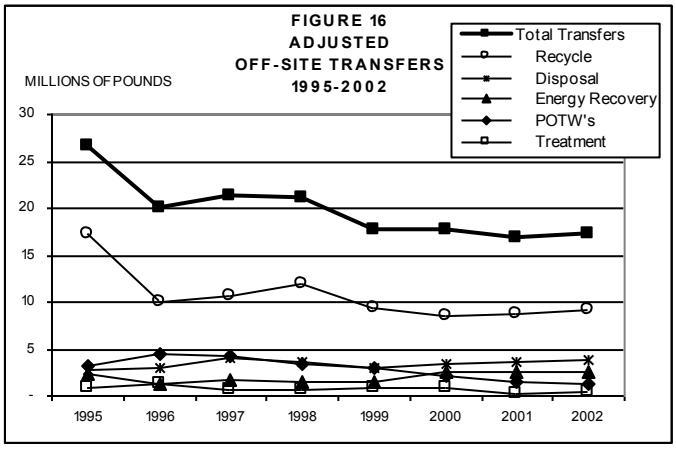



Two facilities ceased operations in 2002; Metachem and Nanticoke Homes. Neither facility filed their 2002 reports due in 2003 because of their closures. Their combined on-site releases for 2000 totaled 116,000 pounds. The state 2002 data might have been higher by approximately half that amount, allowing for their partial year operation in 2002. Metachem is permanently closed, and Nanticoke Homes has resumed operation under another name and may report for 2003.

Significant reported reductions in on-site releases in 2002 include reports from Motiva; decrease in sulfuric acid aerosols (-330,000 pounds) and decrease in methyl-tert-butyl ether (-43,000 pounds. Facilities reporting significant increases in on-site releases in 2002 include reports from Perdue Georgetown; increase in nitrate compounds (240,000 pounds), Formosa Plastics; increase in vinyl acetate (103,000 pounds), Motiva; increase in cresol (56,000 pounds) and increase in phenol (47,000 pounds). Some of these changes may have been caused by changes in the way the facility or EPA estimates amounts, and many of these were discussed in the top 15 or second 15 facility profiles. You may contact the facility for a more in-depth discussion of the reasons for specific changes. The changes noted in the sample above were balanced by other, smaller increases and decreases from other facilities.

## Off-Site Transfers 1995-2002

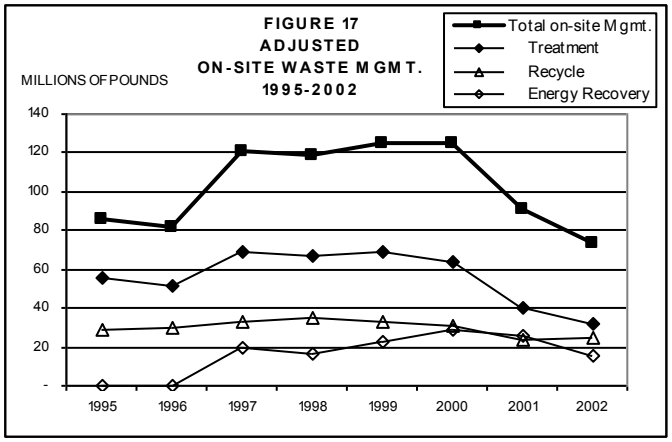
An Off-site transfer is a transfer of toxic chemical in wastes to another facility that is physically separate from the reporting facility. Chemicals are reported as transferred to an off-site facilitiy when they are moved away from the reporting facility for the purposes of treatment at a POTW, recycling, energy recovery, treatment, or disposal. Although the off-site transfers may be of less immediate concern than on-site releases, transfer to categories such as POTW's, treatment, and disposal still represent toxic chemicals in wastes that must be ultimately accounted for. As noted on page 33 and in Table 13 on page 39, the amounts transferred off-site are more than twice the amount of on-site releases. Figure 11 on page 33 and Figure 16 below show the trends in amounts of TRI chemicals in wastes transferred off site and the trends in recent years. Again, the amount of chemicals reported in this 1995-2002 time period is trending down. As noted in prior analysis on page 33, over half of the off-site transfers are to recycling operations.




The total trend in Figure 16 is driven by the trend in amounts sent to recycle. The overall trend for off-site transfers is down since 1995 by 35% (-9,317,000 pounds). In recent years, smaller increases or decreases have caused the trend total to be relatively flat. Reports of significant reductions in 2002 came from: Ciba Specialty Chemicals; decrease in methanol (-413,000 pounds) resulting from reductions in transfers to POTW and to energy recovery, Noramco; decrease in methanol (-178,000 pounds) resulting from decreases in transfers to POTW and to energy recovery, and General Motors; decrease in xylene (-70,000 pounds) resulting from reductions in transfers to energy recovery. Reports of significant increases came from: Noramco; increase in toluene (256,000 pounds) resulting from increases in transfers to energy recovery and treatment, Johnson Controls; increase in lead compounds (253,000 pounds) resulting from an increase in transfer to recycle, Halko; increase in lead compounds (208,000 pounds) resulting from an increase in transfer to recycle, and DuPont Edge Moor; manganese compounds (205,000 pounds) resulting from an increase in transfer to disposal. These changes are balanced by other smaller increases and decreases from other facilities. The total net change in 2002 was an increase of 2.3% (379,000 pounds) from 2001. Again, no reports were filed by Metachem for 2001 or 2002, their last year of opertation. Their 2000 off-site transfers amounted to 383,000 pounds, and it was likely that they had some unreported off-site transfers in 2001 and 2002.

## On-site Waste Management 1995-2002

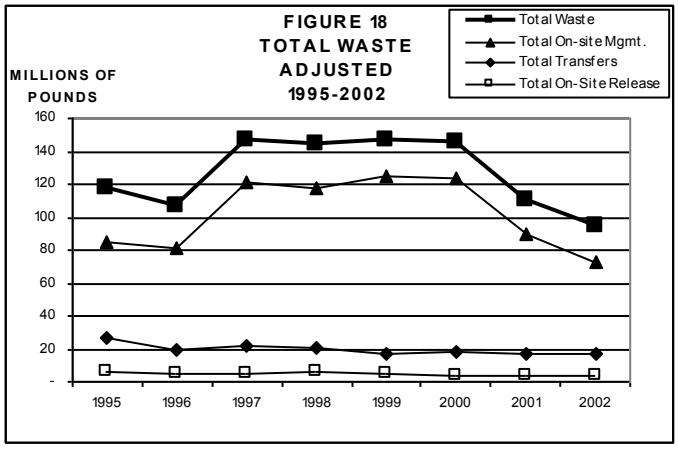
In some facilities, wastes were managed on-site instead of being sent off-site for processing or disposal. On-site waste management is the processing of chemicals in wastes that do not leave the site of the reporting facility. When chemicals are recycled, recovered for energy, or treated at the facility, they are reported as managed on-site. Although these amounts represent a loss of finished product to the facility as waste, they are not as much a threat to the environment as the other categories since these amounts are managed and not disposed of on-site. There is, of course, the risk that these chemicals may be released accidentally on-site to the environment.




On-site treatment is classified by 64 different types, recycling by 16 types, and energy recovery by 4 types. The totals for these three categories of on-site management are shown in Figure 17 and Table 13. In 1997, a 17,000,000 pound increase in ammonia energy recovery and a 16,000,000 pound increase in methanol treatment were largely responsible for the 39,000,000 pound increase in on-site waste management. The total amount of waste managed on-site in 2002 was down 17 million pounds (19%) from 2001. Energy recovery and treatment decreased 39% and 19% respectively, while recycle increased 4%. Significant reductions were: Motiva; methanol, reduction in energy recovery (-10,300,000 pounds) and ammonia, reduction in treatment and energy recovery (-1,000,000 pounds), DuPont Edge Moor; hydrochloric acid aerosols, reduction in treatment (-3,500,000 pounds) and chlorine, reduction in treatment (-2,100,000 pounds). Significant increases in on-site waste management occurred for Noramco; dichloromethane, increase in recycle (549,000 pounds), toluene, increase in recycle (423,000 pounds) and methanol, increase in recycle (365,000 pounds), Motiva; cresol, increase in energy recovery and treatment (228,000 pounds) and phenol, increase in energy recovery and treatment (150,000 pounds). Again, the impact of Metachem was not known for 2002. Metachem reported 993,000 pounds managed on-site for 2000, so the results for 2002 may be understated by approximately half that amount with their partial year operation. Other reductions and increases making up the 17 million pound reduction for 2002 in on-site waste management were smaller. Total pounds for on-site waste management have decreased by 14% since 1995.

## Total Waste 1995-2002

Figure 18 shows totals of the three waste categories taken from the totals in figures 15, 16, and 17, and their grand total. This grand total is largely driven by on-site waste management. Pounds for total waste have decreased by 15% since 2001 and 20% since 1995.



TOXICS RELEASE INVENTORY

## On-Site Releases 1998-2002

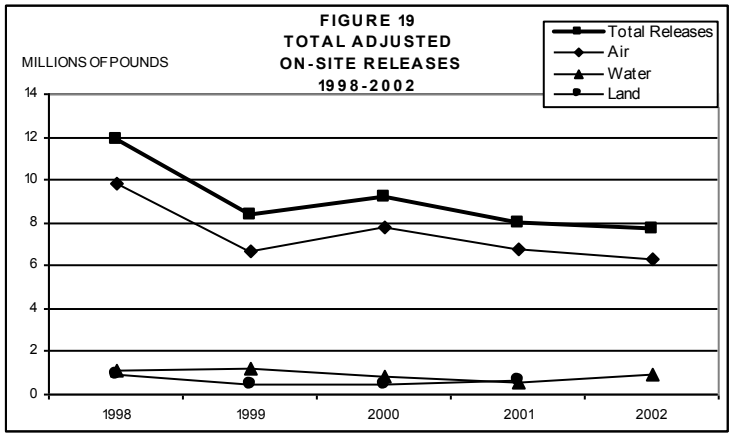
The second set of trends is for the 1998-2002 period. The new industry segments added in 1998 that were excluded in the 1995-2002 trends are included here. Because of the inclusion of additional facilities and chemicals, these totals in Table 14 are higher than those in table 13. Figure 19 shows the trend for on-site releases adjusted for new facilities and chemicals added after 1998. Again, as in the prior on-site trend (Figure 15), the trend is generally down. Although there was an 11% increase in 2000, there has been a decrease of 35% in on-site releases over the 1998-2002 period including the 3% decrease from 2001-2002. In addition to the facility notes on pages 40-41 about how wastes may have changed this year, reports of significant reductions for facilities and/or chemicals added in 1998 and reporting in 2002 are: Indian River Power Plant; reduced hydrochloric acid aerosols (330,000 pounds), and Edge Moor/ Hay road Power Plant; reduced sulfuric acid aerosols (70,000 pounds). A report of significant increase was received from Indian River Power Plant; increase in hydrochloric acid aerosols (320,000 pounds). Changes in types of fuel (coal, oil, or gas), as well as the demand for electrical power and the basis the facility used for estimating releases are responsible for the changes in the power generating facility acid gas releases.

**TABLE 14**
**1998-2002 TRI DATA SUMMARY**
**(IN POUNDS)**
**ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS**

| | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|
| No. of facilities | 79 | 76 | 80 | 80 | 80 |
| No. of Form A's | 70 | 72 | 61 | 57 | 55 |
| No. of Form R's | 271 | 254 | 278 | 283 | 272 |
| No. of Chemicals | 105 | 101 | 102 | 99 | 101 |
| On-site Releases | | | | | |
| Air | 9,787,574 | 6,651,166 | 7,827,600 | 6,780,039 | 6,285,278 |
| Water | 1,126,527 | 1,197,861 | 864,760 | 558,663 | 900,370 |
| Land | 937,708 | 462,579 | 500,395 | 637,024 | 556,219 |
| Total On-Site Releases | 11,851,809 | 8,311,606 | 9,192,755 | 7,975,726 | 7,741,867 |
| Off-site Transfers | | | | | |
| POTW's | 3,334,297 | 2,996,401 | 2,199,804 | 1,575,701 | 1,201,157 |
| Recycle | 11,963,926 | 9,295,315 | 8,649,675 | 8,580,368 | 8,960,940 |
| Energy Recovery | 1,491,543 | 1,389,936 | 2,543,840 | 2,642,626 | 2,538,090 |
| Treatment | 611,996 | 894,822 | 901,603 | 172,939 | 398,571 |
| Disposal | 3,983,506 | 3,056,466 | 3,712,649 | 3,776,121 | 4,073,039 |
| Total Off-site Transfers | 21,385,268 | 17,632,940 | 18,007,571 | 16,747,755 | 17,171,797 |
| On-site Waste Mgmt. | | | | | |
| Recycle | 34,549,050 | 32,671,856 | 31,188,654 | 24,133,520 | 25,033,547 |
| Energy Recovery | 16,155,665 | 22,981,591 | 29,095,220 | 25,863,740 | 15,740,469 |
| Treatment | 68,126,327 | 69,501,151 | 64,403,879 | 40,716,062 | 33,376,635 |
| Total On-Site Mgmt. | 118,831,042 | 125,154,598 | 124,687,753 | 90,713,322 | 74,150,650 |
| Total Waste | 152,068,119 | 151,099,144 | 151,888,079 | 115,436,803 | 99,064,315 |

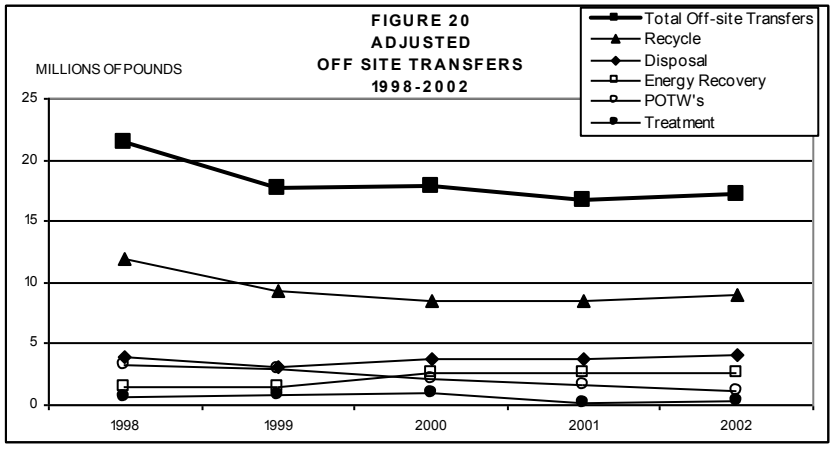
ADJUSTED FOR CHANGES IN REPORTING REQUIREMENTS

SOURCE: DNREC 2001 DATABASE, FEBRUARY 2004



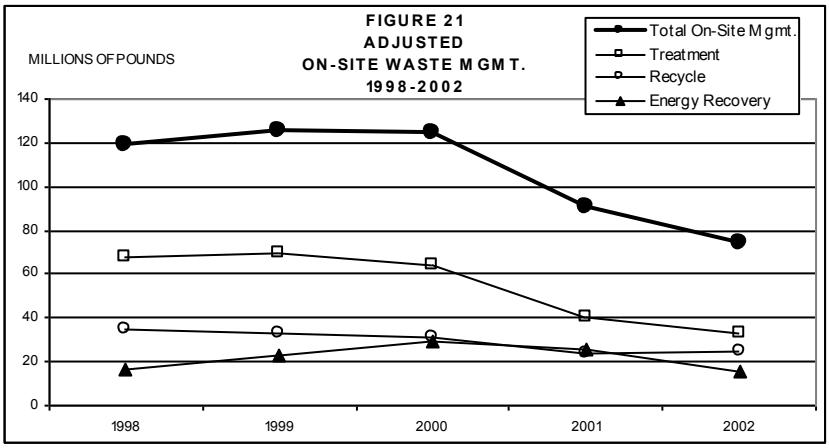
## Off-Site Transfers 1998-2002

Off-site transfers trends were characterized by relatively unchanged amounts of toxic chemicals in wastes sent off-site for 2002. Table 14 and Figure 20 show the amounts transferred off-site, adjusted for the new reporting requirements starting in 1998. Although off-site transfers increased 3% in 2002, they have decreased 20% since 1998. There are no facility notes not already mentioned on page 40 for off-site transfers in this period.



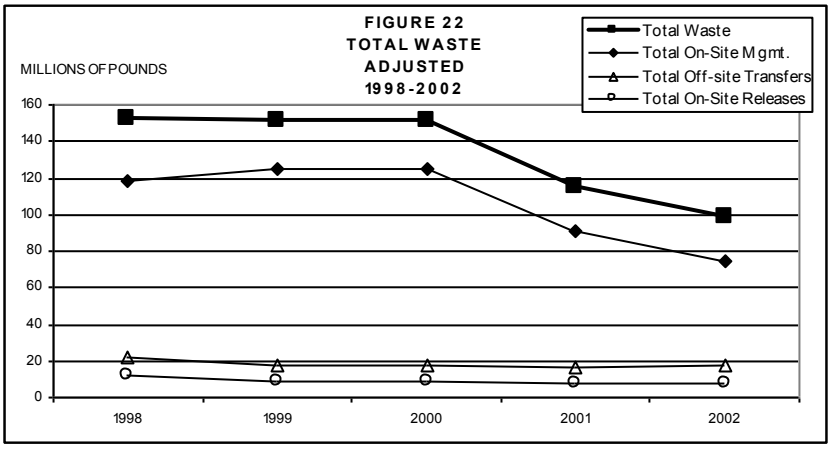

## On-Site Waste Management 1998-2002

The trend of on-site management of TRI chemicals in waste shows a continuing strong downward trend in 2002 due to declines in two of the three waste management activities as shown in Table 14 and Figure 21. Again, these figures include the newly added industry groups that started reporting in 1998. There are no changes of note for these new facilities in addition to the previously noted 17 million pound decline in 2002 and the facility notes for on-site waste management on page 41.




## Total Waste 1998-2002

Figure 22 shows the sum of On-Site Releases, Off-Site Transfers, On-site Waste Management, and their grand total. The 2001-2002 trend is down by 14%, and the 1998-2002 trend is down by 35%, again driven by on-site waste management.



TOXICS RELEASE INVENTORY

## Carcinogens Trend, 1995-2002

The number of Carcinogen reports increased by one to 103 in 2002 following a large increase in lead and lead compounds reporting in 2001 (because of the reduced reporting threshold). The total number of carcinogen chemicals was unchanged at 32. Although the downward trend of all on-site carcinogens reversed and increased by 9% in 2002 due to the 77% increase of the "possible" carcinogen (2B) category, this was because of a change is the basis for reporting vinyl acetate and probably not an actual increase in release. The "known" and "probable" categories were down by 8% and 20%, respectively. Total on-site releases of all Carcinogens decreased by 14% since 1995. Carcinogens are classified into three groups by IARC, the International Agency for Research on Cancer: Group 1 - Known, Group 2A - Probable, and Group 2B – Possible. A list of carcinogens reported in Delaware is provided on page 4. On-site releases of all carcinogens comprise 7.5% of all on-site releases in 2002, and have decreased 30% since the peak in 1998 when the new facilities were added. Table 15 provides the individual data and overall totals for each of the IARC classes of carcinogens, and Figure 23 graphically illustrates the trend.

As with the prior trends,

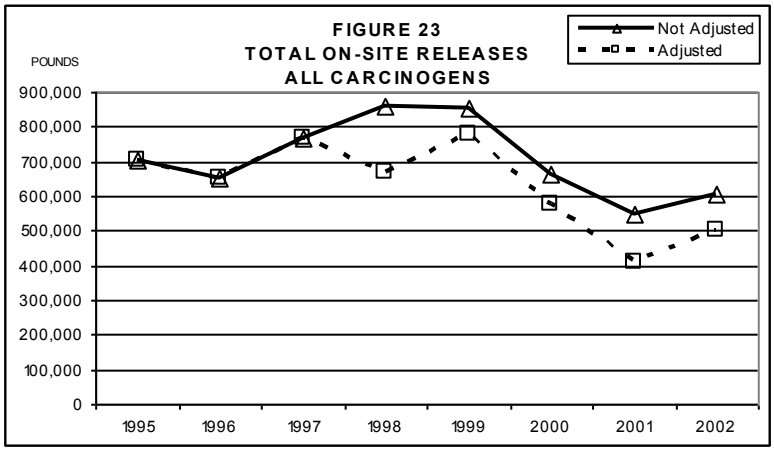
**TABLE 15**

**1995-2002 CARCINOGENS**

**ON-SITE RELEASES, NOT ADJUSTED**

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|
| **KNOWN** | | | | | | | | |
| AIR | 253,818 | 225,184 | 192,099 | 209,094 | 219,970 | 209,828 | 209,295 | 177,473 |
| WATER | 596 | 201 | 6,917 | 10,246 | 3,048 | 4,395 | 9,114 | 9,682 |
| LAND | 1,791 | 331 | 286,041 | 363,793 | 306,630 | 258,008 | 169,197 | 170,074 |
| **KNOWN TOTAL** | 256,205 | 225,716 | 485,057 | 583,133 | 529,648 | 472,231 | 387,606 | 357,229 |
| **PROBABLE** | | | | | | | | |
| AIR | 113,482 | 78,491 | 55,274 | 53,558 | 139,293 | 55,418 | 44,326 | 35,581 |
| WATER | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LAND | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **PROBABLE TOTAL** | 113,482 | 78,491 | 55,274 | 53,558 | 139,293 | 55,418 | 44,326 | 35,581 |
| **POSSIBLE** | | | | | | | | |
| AIR | 331,904 | 344,888 | 223,518 | 167,420 | 186,506 | 135,946 | 91,851 | 189,296 |
| WATER | 359 | 351 | 196 | 1,175 | 290 | 271 | 4,873 | 2,109 |
| LAND | 0 | 5 | 2,550 | 51,625 | 142 | 40 | 21,607 | 17,475 |
| **POSSIBLE TOTAL** | 332,263 | 345,244 | 226,264 | 220,220 | 186,938 | 136,257 | 118,331 | 208,880 |
| TOTAL AIR | 699,204 | 648,563 | 470,891 | 430,072 | 545,769 | 401,192 | 345,472 | 402,350 |
| TOAL WATER | 955 | 552 | 7,113 | 11,421 | 3,338 | 4,666 | 13,987 | 11,791 |
| TOTAL LAND | 1,791 | 336 | 288,591 | 415,418 | 306,772 | 258,048 | 190,804 | 187,549 |
| **GRAND TOTAL** | 701,950 | 649,451 | 766,595 | 856,911 | 855,879 | 663,906 | 550,263 | 601,690 |

Source: DNREC TRI 2002 Database, February 2004



adjustments must be made for changes in reporting requirements in this period, and the trends of both unadjusted and adjusted values are shown in Figure 23. Table 15 contains only the unadjusted values. Chemicals and facilities required to report only during a portion of the period because of changes in reporting requirements have been excluded for the entire time for the "Adjusted" trend. These adjustments generally involve the power generating and ore processing industries and include metallic compounds produced from impurities in the fuel and raw materials used by these facilities. These facilities were required to start reporting in 1998. Adjustments occurring in this period affected the air, water, and land release amounts. New reports for lead and lead compounds at their lower thresholds starting in 2001 accounted for 20,500 pounds of exclusions in 2002. Prior years' lead and lead compounds reports under the higher thresholds were not excluded if the facility was already reporting them. Table 3 on page 4 shows the number of facility reports for each IARC-classified chemical, and additional carcinogen report detail is in Appendix J.

**Known Carcinogens**

From 1997-2000, the land release of nickel compounds at Motiva greatly influenced the values for known carcinogens. Their 1997 value was 283,000 pounds. Now, because the Motiva amount is lower at 70,000 pounds, nickel compounds are second highest in this category. Vinyl chloride, with a total release of 140,000 pounds and released by Formosa and Kaneka, is highest. Chromium compounds released almost entirely to land by Motiva and the Indian River Power Plant are third place in Known Carcinogen on-site releases.

Air releases of known carcinogens have been gradually declining, and vinyl chloride contributes 84% of the known carcinogen category air releases. Vinyl chloride constitutes over 36% of all carcinogen category air releases and 28% of all carcinogen category total on-site releases for air, water, and land in 2002. Formosa Plastics released 103,000 pounds of vinyl chloride and Kaneka reported 36,000 pounds in 2002. Nickel compounds were #2 in on-site releases. Motiva and the Indian River Power plant reported 91% of the nickel compound releases. Benzene reports, mostly from Motiva and Sunoco, have declined from 58,000 pounds in 1995 to 11,742 pounds in 2002. Benzene made up 7% of the known carcinogen air releases.

Water releases on-site of known carcinogens are 2.8% of the known carcinogen total, mostly benzene and nickel compounds.

**Probable Carcinogens**

Almost all Probable class carcinogens were released to air during this period. The largest air release contributors were 1,3,-butadiene, reported by Dow Reichhold, and trichloroethylene, reported by Camdel Metals. They combined for 84% of the Probable class releases. The trend for 1,3,-butadiene is down 76%, now at 17,369 pounds from a high of 72,439 pounds in 1995. Trichloroethylene release has declined 57%, from 29,332 pounds in 1995 to 12,658 pounds in 2002. The Probable Carcinogen air release high number in 1999 (139,923 pounds) in Table 15 was due to an 83,000-pound reported release of formaldehyde from Motiva.

**Possible Carcinogens**

The top release in this class is vinyl acetate, primarily released by Formosa Plastics, and accounts for 63% of the total class release. This release was estimated using a higher basis for 2002 and was the primary reason for the upward trend in total carcinogens this year. Although the reported amount is much higher, (115,000 vs. 12,000 pounds for 2001), the actual amount may not be much different from prior years since there was a change in basis. Styrene, 72% of which is released by Justin Tanks, is the second highest on-site release for this class. Styrene

accounts for 24% of the total release for this class. The Justin Tanks' trend has increased 30% since 1995, and total styrene releases have increased by 8% over the 1995-2002 period.

As before, in ***Limitations of TRI Data*** on Page 6, we urge caution when using this data, as THIS DATA DOES NOT INDICATE AMOUNT OF HUMAN EXPOSURE.

# FOR FURTHER INFORMATION

**Access to the TRI Files** - DNREC is responsible for collecting, processing, and distributing information submitted by Delaware facilities under the TRI program. This 2002 TRI report may be viewed at: www2.state.de.us/serc/reports.htm. Additional information not contained in this report is available to the public through the EPCRA Reporting Program located within DNREC. A second, less technical data summary is available at the same location. A searchable database is located at: http://www2.state.de.us/serc/search/index.htm.

The reports submitted by facilities are available for review through the Freedom of Information Act process from DNREC's Air Quality Management Office located at 156 South State Street in Dover. Custom reports can also be generated from the database. For information on placing a request, call the TRI Coordinator at (302) 739-4791 during business hours. An on-line FOIA application is also available at: http://www.dnrec.state.de.us/air/aqm_page/foia.htm.

**Chemical Data Fact Sheets** - A two-page fact sheet is available for most TRI chemicals reported in Delaware and contains information on chemical characteristics, health hazards, and ecological effects. These fact sheets were prepared by the EPCRA Reporting Program from information obtained through EPA's more lengthy TRI chemical fact sheets. The two-page fact sheets are available upon request. Additional TRI chemical information is available at: www.epa.gov/triinter/chemical/index.htm

**EPA's TRI Home Page** - The TRI home page provides information on the many facets of the TRI program at EPA, including an Executive Summary, Q&A's, a link now to the 2001 TRI data, and later this year to 2002 data, a current list of reportable chemicals, reporting forms, state and federal program contacts, and various guidance documents available for downloading. This website has many links to other EPA and non-EPA sites associated with TRI. www.epa.gov/tri/

**Toxics Release Inventory Public Data Release** - EPA's annual TRI report. It covers information nationwide and provides a good perspective on how Delaware compares to other states www.epa.gov/tri/tridata/index.htm . The 2002 edition of this report will be available later this year and will available for review at the DNREC office at 156 South State Street in Dover. It can also be obtained by calling the federal EPCRA Information Hotline at 1-800-535-0202.

**Envirofacts Electronic warehouse** - Envirofacts is an EPA-developed website that provides public access to multiple environmental databases, including TRI. Links can be made to data about hazardous waste, water permits, drinking water, Superfund sites, and more. On-line queries allow the user to retrieve data and create reports, as well as generate maps. www.epa.gov/enviro

**Right-to-know Network** Searchable nationwide TRI data is available through RTKNet. The RTKNet was established by two non-profit organizations to provide access to TRI and chemical data, link TRI with other environmental data, and exchange information among public interest groups. www.rtk.net

**Delaware Public Health Cancer Rates and Causes**
This site provides data and answers to many cancer-related questions.
http://www.state.de.us/dhss/dph/dpc/cancer.html

**The Office of Pollution Prevention & Toxics** is a part of the EPA that:

- Promotes pollution prevention as the guiding principle for controlling industrial pollution;
- Promotes safer chemicals through a combination of regulatory and voluntary efforts;
- Promotes risk reduction so as to minimize exposure to existing substances such as lead, asbestos, dioxin, and polychlorinated biphenyls; and,
- Promotes public understanding of risks by providing understandable, accessible and complete information on chemical risks to the broadest audience possible.

It is also a link to *Risk-Screening Environmental Indicators.* This model was developed by EPA's Office of Pollution Prevention & Toxics as a risk screening tool that provides a relative comparison of TRI releases. This application is available on CD-ROM or through the Internet. Both of these are available through: www.epa.gov/opptintr

**Delaware's Pollution Prevention Program** can be accessed at: http://www.dnrec.state.de.us/dnrec2000/pollutionprevention.asp

**Environmental Defense Fund Scorecard** - The EDF Scorecard combines scientific, geographic, technical, and legal information from many databases (with emphasis on TRI) to enable users to produce detailed local reports on toxic chemical pollution. Chemical profiles and a map generator are also available through the Scorecard. www.scorecard.org

**2002 Delaware Air Quality Report** - The annual air quality report is prepared by the Air Surveillance Branch in the Air Quality Management Section of DNREC. This report presents data gathered from a statewide network of air monitoring stations, and includes analyses, trends, and other information regarding Delaware's ambient air quality. For a copy of the report, or for more information, please call (302) 323-4542. This report is available on-line at: www.dnrec.state.de.us/air/aqm_page/reports.htm The EPA site for additional air quality information is: http://www.epa.gov/oar/oaqps/publicat.html

**Delaware's Department Of Natural Resources and Environmental Control** has a variety of environmental information available at: www.dnrec.state.de.us/dnrec2000/Elibrary.asp In addition to TRI, there are other provisions of the Emergency Planning and Community Right to Know Act (EPCRA) which provide information to the public as well as to local emergency planning and response organizations. Delaware has its own EPCRA statute, which established these provisions under state law. For additional information, visit the Delaware EPCRA website at http://www2.state.de.us/serc/

Questions or comments regarding TRI are welcome. Please direct questions, comments, or requests to:

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EPCRA Reporting Program
Air Quality Management Section
Division of Air and Waste Management, DNREC
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Dover, DE 19901
Tel. (302) 739-4791, Fax (302) 739-3106
E-mail: john.parker@state.de.us